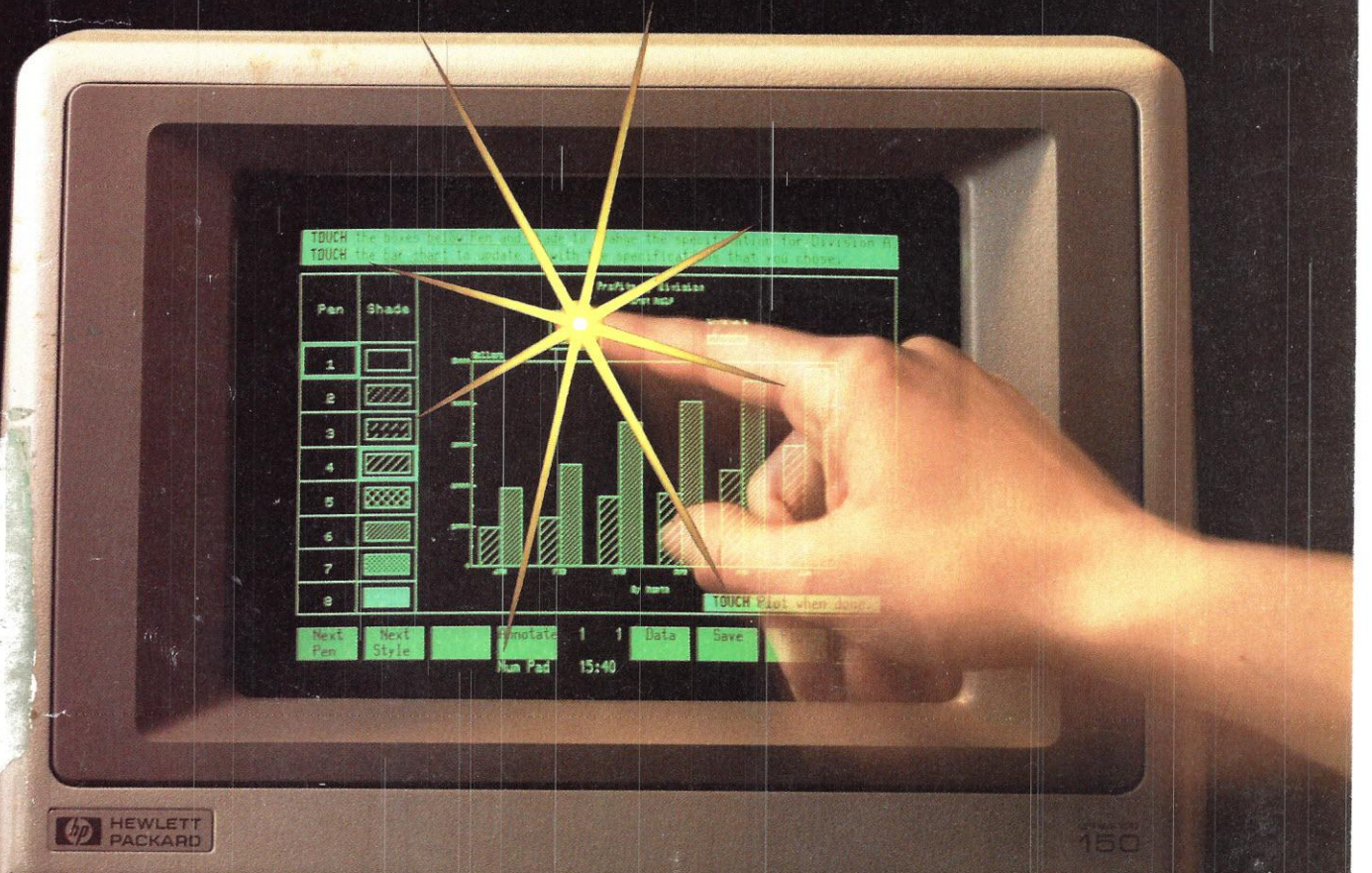
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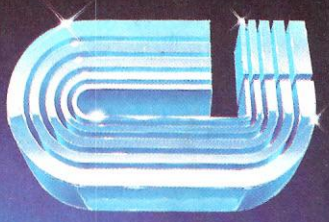
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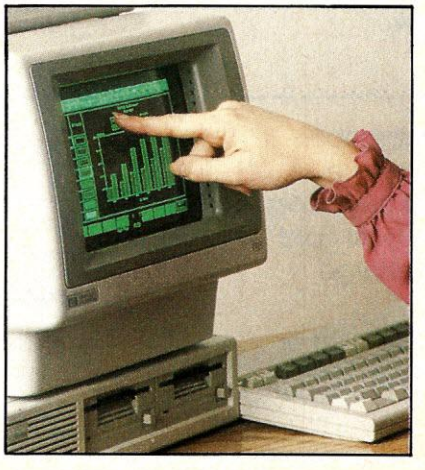
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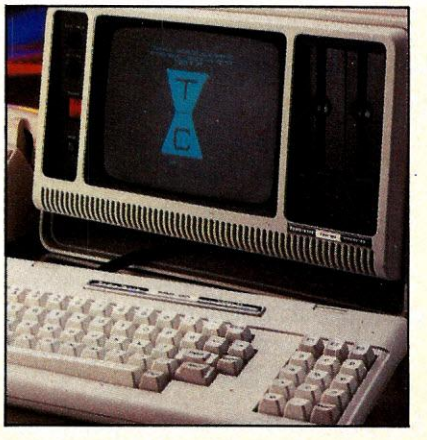
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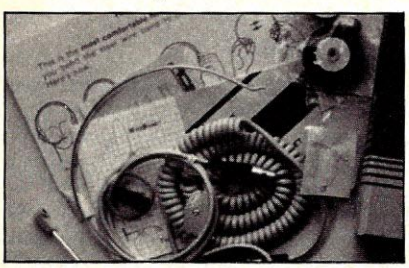
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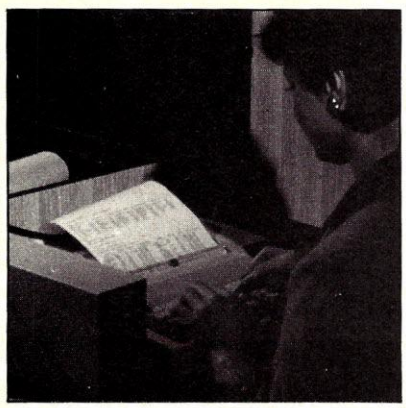
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By Wayne Green

A Clockwork Commodore

It's 1984... Your Computer Is Watching You

Yes, whether we like it or not, mind control has arrived—starting with the Commodore-64 computer. Yes, it is going to be a lot easier to seduce women—a whole lot easier—or men, if that ever gets to be a problem for women.

A few years ago there was a flap when a movie theater in New Jersey experimented with the subliminal advertising of popcorn, increasing its sales enormously. Aha! said the advertising agencies, let's start using this on television and really sell our products.

Members of Congress quickly whipped themselves into a frenzy over the idea of their opponents getting subconscious votes and set about making subliminal messages on TV illegal. However, something as effective as this was bound to reappear one way or another.

Do subliminal messages work? And if so, how do they work? First, yes, you bet they work. In fact they work far better than even some of the people in the field recognize. These seemingly invisible messages can have a profound effect on people. I'll explain how they work so you can better understand why they have so much power.

With subliminal messages, you are dealing directly with the subconscious mind. This is a nonthinking aspect of the brain. It is completely literal—more like a computer—with no emotional twisting or motivations. It is this aspect of the brain that hypnosis addresses. That's right, subliminal messages are actually hypnotic instructions going directly to your brain, shielded from your conscious mind...your awareness. Perhaps now you see why I say the method is so powerful.

On the positive side, this type of behavior modification can be good—to thin you down, to help you stop smoking and so on. But there are as many or more negative uses. We really have to come to grips with this and not let the hucksters give us a bunch of baloney.

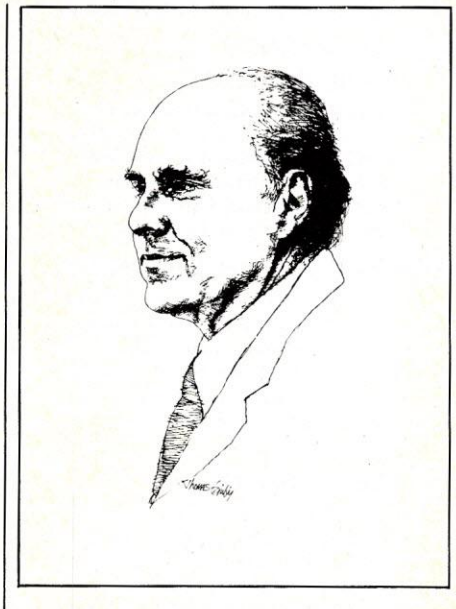
Will the incredible benefits that this technology can bring us be lost just because the tool can be misused? Probably, sad to say. Remember that an awful lot of doctors, hospitals and medical firms have a vested interest in your getting sick. A technology that could cure cancer without drugs would be fought bitterly by the medical establishment. Heck, they could lose 50 percent or more of their business, so, of course, they'll fight with every weapon at their command.

Good-Bye Athlete's Foot

Can hypnotism and subliminal messages cure everything from cancer to athlete's foot? Hell, I don't know! No one has tested it for those uses yet that I've read about. But the likelihood is strong that this is something big. You've probably read Norman Cousins' book on how he laughed his way out of terminal cancer. I don't yet know how much power the mind has to cause or cure sickness—but I do know that those medicine men in Africa are doing their work about as effectively as our "modern" medicine.

Can subliminal messages help cure the smoking habit? You bet—and don't forget that every cigarette is taking an average of 15 minutes off your life—that's about five hours per package, four days per carton! It mounts up. I've lost a lot of my smoking friends to cancer, heart disease and so on. But if the subconscious mind is under some kind of control, it will not only cure this addiction but also put in the positive word right at control center—the brain.

Well, if you are ready to get started with this interesting new field, the Ex-



pando-Vision interface for your TV set is $90 and the ROM cartridge software is $40 a whack. I suspect that it will be a matter of weeks before someone writes an article on how to program the 64 to work with the interface without the ROM cartridge—and probably a few months before the information is published and mind control is let loose on the public.

A Bunch of Rot

An early worry about hypnotism was that men would use it to have their way with women. Another was that it might be used to make people commit crimes against their will. Well, this was such an emotional problem that the hypnotists concocted a big lie to solve it. They told people not to worry about hypnotism—shucks, no one could really be

made to do anything that seemed morally unacceptable. What a bunch of rot.

If someone were hypnotized for a test and told to kill a person, he would sure enough grab a gun and "shoot" him, believing that the gun was loaded. Obviously this person would not find murder morally objectionable. It's unfair to let the charlatans use subliminal persuasion under the guise that it's harmless.

Hypnosis, like acupuncture, was a medical no-no for a long time. The power of hypnotism is now better understood, even if no one is really sure how it works on the brain. By contacting the subconscious mind—the reactive mind it is often called—an incredible power to cure many, if not most, illnesses may be developed.

Just as the subconscious may be the root of illnesses, it can be implanted with messages that can trigger them—or just about anything else desired in behavior. Remember, the conscious mind and your control are both bypassed. I am dealing here directly with the brain just as I would program a computer.

Sure, I can inject harmless little messages that tell you that you feel good. I can tell your brain that you are thin—and you will tend to think thin. But how long will it be before this innocuous use turns more sinister—maybe making you buy Exxon gas—or worse, a Dodge?

How long will it be before this innocuous use turns more sinister—maybe making you buy Exxon gas—or worse, a Dodge?

So here is the first product on the market to provide subliminal messages over your television set. It flashes the messages while you are watching TV and it's so fast that you aren't consciously aware of even seeing the message. But it's there and doing its work. That's 1984 mind control.

Oh, it won't be long before even more sophisticated systems won't show a small flash on the screen when they send a message. They'll manage to superimpose it over the video picture every now and then—who knows what evils this will bring? No, they can't do it over the air—maybe not on cable either—but how about in hotels? And what's to stop you having at your kids via the TV set instead of nagging them about their homework, brushing their teeth, eating good foods instead of junk and so on? It could be that you can prevent tooth decay via this direct hypnosis.

Can a degenerative disease such as Alzheimer's be stopped with messages telling you that your memory is getting better and better? If you think that medicine is very far along in its research, remember that acupuncture was the work of witch doctors until recently and it is still not understood. And remember that there are still miracle cures, and faith cures that work frighteningly well... somehow.

At an Expando-Vision press party in Boston I listened to Dr. LaBenne, a professor of educational psychology at Eastern Michigan University, tell the media that people can't be made to go against their moral ideas under hypnosis. That's the old saw, but I haven't seen any proof of it—and the way I understand the workings of the mind, it isn't so at all.

The programming from Expando-Vision seems innocuous and I see no harm in giving it a try. The good doctor didn't want to let the press see all of the messages, but those we did see seemed harmless—even the ones encouraging good sex.□

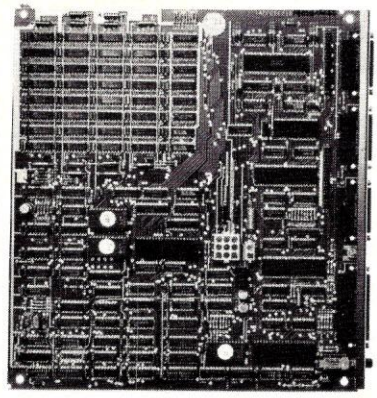
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An Interactive Imagination

Get Closer To Your Micro

I think that you will enjoy this month's articles, which deal with "interactive" micros. This month, you'll find reviews of different types of hardware and software that, in their individual ways, interact with users. There are issues that interactive computers address, as well as a host of new issues that are created when engineers design machines that bridge the gray zone, which exists between person and machine.

The Hungry Years

The early days of microcomputing were relegated to what we now call hackers. Switches had to be toggled following a cryptic code in order for a computer to even accept further coding from paper tapes. There was little, if any, software.

The shroud surrounding these machines of relatively limited computing power kept all but the brave from venturing into the microcomputer world. I can remember spending many an hour toggling the bootstrap loader into my PDP-8/E only to be forced to begin again when the machine crashed. Finally, beginning with the TRS-80 Model I in 1977, came an incredible ease of use. ROM made it possible for the machine to boot itself. Users could go about using the machine rather than toggling switches. Yet micros still suffered from a sort of cult status. Software, while more readily available, was cumbersome and difficult to use. Software visionaries caught on, and with such programs as VisiCalc and WordStar the micro revolution gathered momentum. The hardware-driven market became a market powered by useful software.

Microcomputing then attracted another stratum of users. It spurred hardware and software developers to make products easier to use. And so it has gone for the past few years.

The Human Factor

A key to attracting the masses to microcomputers in the years ahead isn't hardware or software as separate entities. The next logical step is to create both hardware and software that will be extensions of human reflexes.

The past few years have seen the refinement and popularization of mice, touch screens and voice recognition devices.

These bridges between machine and human interaction will continue to have a profound effect on how many people partake of microcomputer technology. If we accept today's technology as beginnings then what lies ahead to finish bridging the gap? Will today's devices be the end of the line? Hardly.

It's Only Just Began . . .

They are only the beginning. What lies ahead five years is as hard to predict as what we could have imagined happening five years ago.

K.T.

Sneak Previews

In May, *Microcomputing* focuses on operating systems. We'll examine the merits of CP/M and MS DOS. The Unix system is being touted as the operating system of the future, and in May we answer the question, "What's the big deal about Unix?"

Laptops are the rage in today's micro market, and in June we compare five of the leaders. June also marks the debut of several new columns. That's just the tip of the iceberg . . . we have a lot more surprises up our sleeves. This is one issue you won't want to miss!

Software Review Board

As we've been alluding to for some time, there are some exciting things in the works for *Microcomputing*. We can't give you any more details yet, but we can discuss one of the changes we'll be making.

You've probably noticed that we print several software reviews each issue. In order to keep our reviews timely and consistent, we are creating the *Microcomputing* Software Review Board. We welcome your applications.

Basically, what we're looking for are readers/reviewers with a good grasp of the microcomputing field in general and specific expertise in one area (word processing, databases, languages, utilities . . .) or with one system (Apple, IBM, Tandy, Heath, CP/M and S-100-based machines). Equally important is a flair for writing.

As we receive software, we'll sort it and send it to the appropriate board member.

If all this sounds interesting, we'd love to hear from you. Send a letter describing your background and a writing sample to Software Review Board, *Microcomputing*, 80 Pine St., Peterborough, NH 03458.

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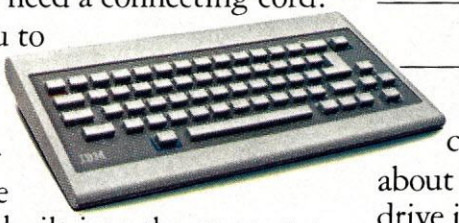
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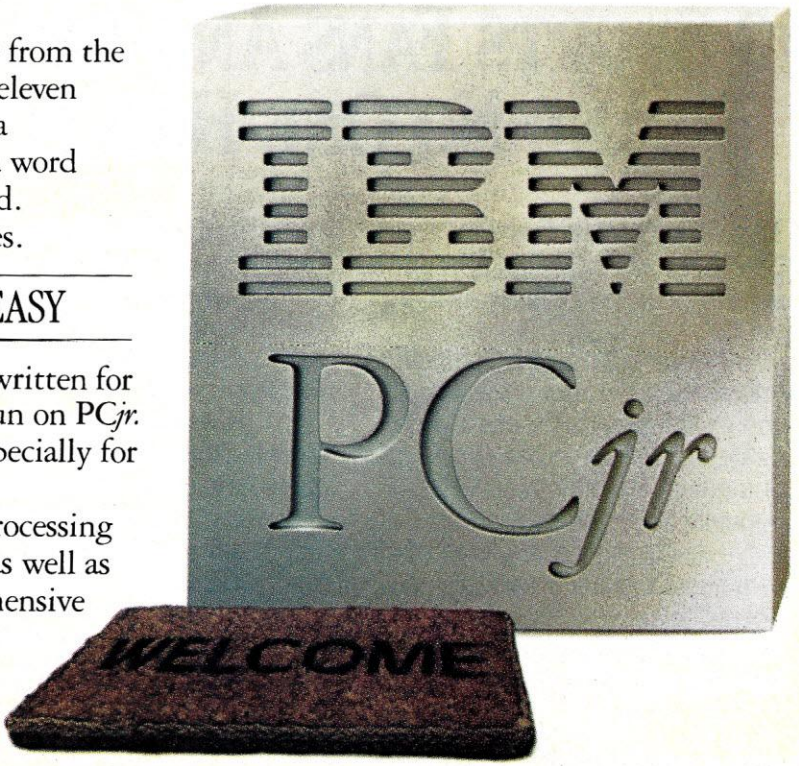
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LETTERS TO THE EDITOR

Microcomputing encourages readers to express their opinions and viewpoints in its "Letters to the Editor" forum.

Letters should be doubled-spaced and sent to *Microcomputing* magazine, "Letters to the Editor," 80 Pine St., Peterborough, NH 03458; or contact us on CompuServe (70116,752) or SourceMail (ST8283).

Another Victim Of JRT Systems

I just received the February issue of *Microcomputing* and I was interested to read the letter from Gary Swallow (p. 8) about JRT systems.

I also sent in money for the Pascal package offered and never received a reply or had a phone call answered until late in October 1983. A woman answered my 14th call and told me that my order would be shipped by the end of December 1983. Needless to say, it hasn't.

I have a notice from the United States Bankruptcy Court for the Northern District of California indicating Case No. 1-83-01424 with a hearing date of 12/20/83 concerning JRT Systems, Inc. This company is or was filing for protection under Chapter 11 of the bankruptcy laws.

Like Mr. Swallow, I also have a canceled check but no software. I do not intend to purchase additional software from firms until I have determined what their credit rating is. Normally, I purchase the software from my computer dealer, but there are times when my dealer doesn't carry the specific items that I need.

Oh well, live and learn.

James H. Rice
Rushville, NY

Those Mice Are Rats

Mouse: A little box-like thing that hangs off an otherwise fine computer, serving to make that computer almost impossible to use.

I suppose there are going to be people out there who can use a mouse effectively and those people will disagree with just about everything I have to say from this point on.

Today, for the first time, I got to use a mouse. As you can probably already tell, I was not overly impressed. My reasoning, if you will be so kind as to agree that this approaches reasoning, is as follows:

Looking at an arrow on the screen while scooting the little bugger around on the table top was not that easy, at least not on the first try. But I suppose that I should remember that I am the guy who nearly desticked the joystick on my boy's Atari trying to turn a corner with a race car. The only problem turned out to be that I was holding the silly thing the wrong way.

I immediately noticed that this thing requires space on the desktop, a commodity I haven't seen in a decade. In order to access any of the marvelous things available to me, I would have to drive the little critter through several coffee cups—some full, some not—a few piles of paper, tools, gloves, hats, coats and Lord knows what else. (Maybe there's a four-wheel drive model available.)

I'm getting good at holding down seven keys at a time in order to get a job done with the old antique I own. To type in DIR:1 or SAVE or LOAD is not that hard, is it? Besides, I thought that the direction that we were supposed to be going in was the direction of having less between us and the computer.

After just a few minutes of going from mouse to CRT to keyboard back to mouse, I was dizzy. Maybe if the mouse could crawl up onto the screen where I could see it and if I could move it around with the arrow keys I might like it better.

I suppose the next generation is just flashing right by me. They tell me that with even just a little practice, you begin to wonder how you could have gotten along without a mouse for so long. This may be true. To tell you the truth, I look forward to my next chance to prove myself against its mousehood.

The computer I used with the mouse was Apple's new wonder kid. To give Mac its due, I must say that if anyone can challenge IBM's foothold in (on) the industry, it's the people at Apple, and the machine is the Mac and its sister Lisa. Everyone likes to see imagination's best brawn.

Larry Ahern
Henniker, NH

C-64 Goes Condo

The table of contents of the December issue of *Microcomputing* (p. 52) indicates that my program in "Commodore and Condominiums" was written for the C-64. It was written for the CBM 8032. I have received a number of letters and telephone calls from readers having problems running the program.

There are a number of changes that need to be made before it will work properly on the C-64. A revised program that will run on the C-64 is on p. 100.

Edward F. Steinfeld
Hudson, NH

No CoCo

I am an owner of a TRS-80 Color Computer and I am an avid reader of your magazine. However, most of your articles are about Commodore, Apple or IBM computers. Sometimes, you do print an article about the TRS-80 Model III or 16, but never about the Color Computer.

All that I ask is that you write a program or even an article about the Color Computer in your magazine.

John Fine
Harrison, NY

Reply:

You're right, John, we don't do much on the Color Computer. However, if you have an innovative, intermediate-level application for the CoCo, send it our way. Good luck.

Editors

Learn A Lesson From Slim Whitman

I believe that there is a better way than tedious promotions to sell computers (Publisher's Remarks: Computer Marts: Medieval Marketing, *Microcomputing*, January 1984, pp. 6–7). The fairs of the Middle Ages depended on the need of rural people to socialize. Now that 90 percent of Americans are urban, why not advertise with 15–30 minute videos on cable television channels. This would be more convenient for the prospective computer purchaser and would subject the manufacturer to the scrutiny of both the FTC and the FCC.

Two years ago, an Australian singer, Slim Whitman, sold one million record albums purely through television promotion. No American radio station played any of the songs on the album. IBM, Apple, Commodore, DEC, please take note—there is a better way.

Joe Roberts
Wichita Falls, TX

By Mark Robillard

The Terminal Wrap-Up

And Now, The Complete Terminal System Unveiled

In January, I described the basic operations of a color graphics terminal and outlined the principles of raster scan imaging and character drawing on a CRT. That article was the beginning of a four month miniseries on the design of portable terminal systems. This month's column focuses on the complete terminal systems design.

Reviewing the basics of portable systems design, I arrive at a list of features that are desirable in a portable system.

The first thing that comes to mind is battery operation. This is not always possible, and when you are dealing with a CRT terminal or a similar display device, it becomes almost impossible. So, the first item on my wish list for a portable system, battery operation, is thrown out the window.

This month, the portable terminal that will be described requires a +5V and −12V power supply. This supply does not require that it be large enough to power an entire room of electronics. As it is, the terminal contains only nine integrated circuits.

The second item on my wish list for portable systems is true portability (that is, small relative size). The terminal control electronics provided here measures 4½ × 6 inches. Another item is programmability or the ability to adapt to many situations. This particular terminal is probably more programmable than you will need 90 percent of the time.

The February "Techniques" column introduced a revolutionary integrated circuit called the National Semiconductor NS455 TMP. This product forms the basis of my portable terminal card design. As you recall from that article, it is hard to find a smaller, more portable implementation with all of the features incorporated into this chip. In fact, here you see the bare minimum required to implement a complete intelligent terminal using the NS455.

Last month, the portable system I've been talking about reached out and touched the world through telecommunications. More specifically, it utilizes single chip modem technology to communicate over telephone lines. This month I'll attempt to connect both the TMP and the National Semiconductor MM74HC943 modem chip together into an intelligent telecommunications terminal.

First, let's review terminals in general.

Terminal Characteristics

As you may know, there are two basic types of interactive terminals: alphanumeric and graphic. The alphanumeric terminal of today typically displays 24 to 25 horizontal lines of between 80 and 132 characters per line. This data displayed on the screen is allowed to scroll up or move up one line at a time as more information is entered.

Some of these alphanumeric terminals have internal character buffers that allow you to reverse scroll so that none of the information is lost should it go by too fast. The characters that make up the 80 × 24 display are usually composed of a matrix of dots 5 × 7 or 7 × 9 in dimension. The 7 × 9 variety usually gives the best resolution for upper- and lowercase characters.

The alphanumeric terminals of the early to late '70s provided a white character on a black background. Some of the newer systems, such as the Apple Lisa and others, are now displaying a white background with a black character that looks more like a page of text.

From the early alphanumeric terminals came the ability to draw pictures with blocks formed within the character cell. The first graphics characters on personal computers, shown in the old Model I TRS-80, were six blocks divided up as

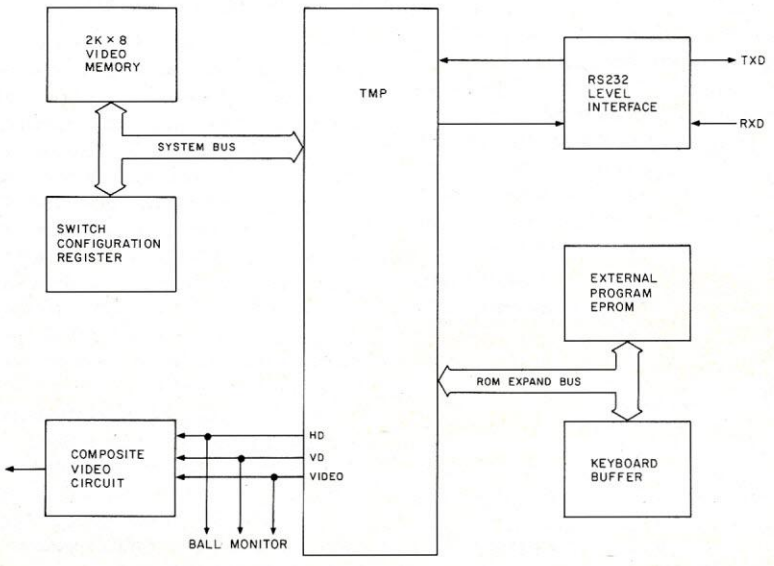


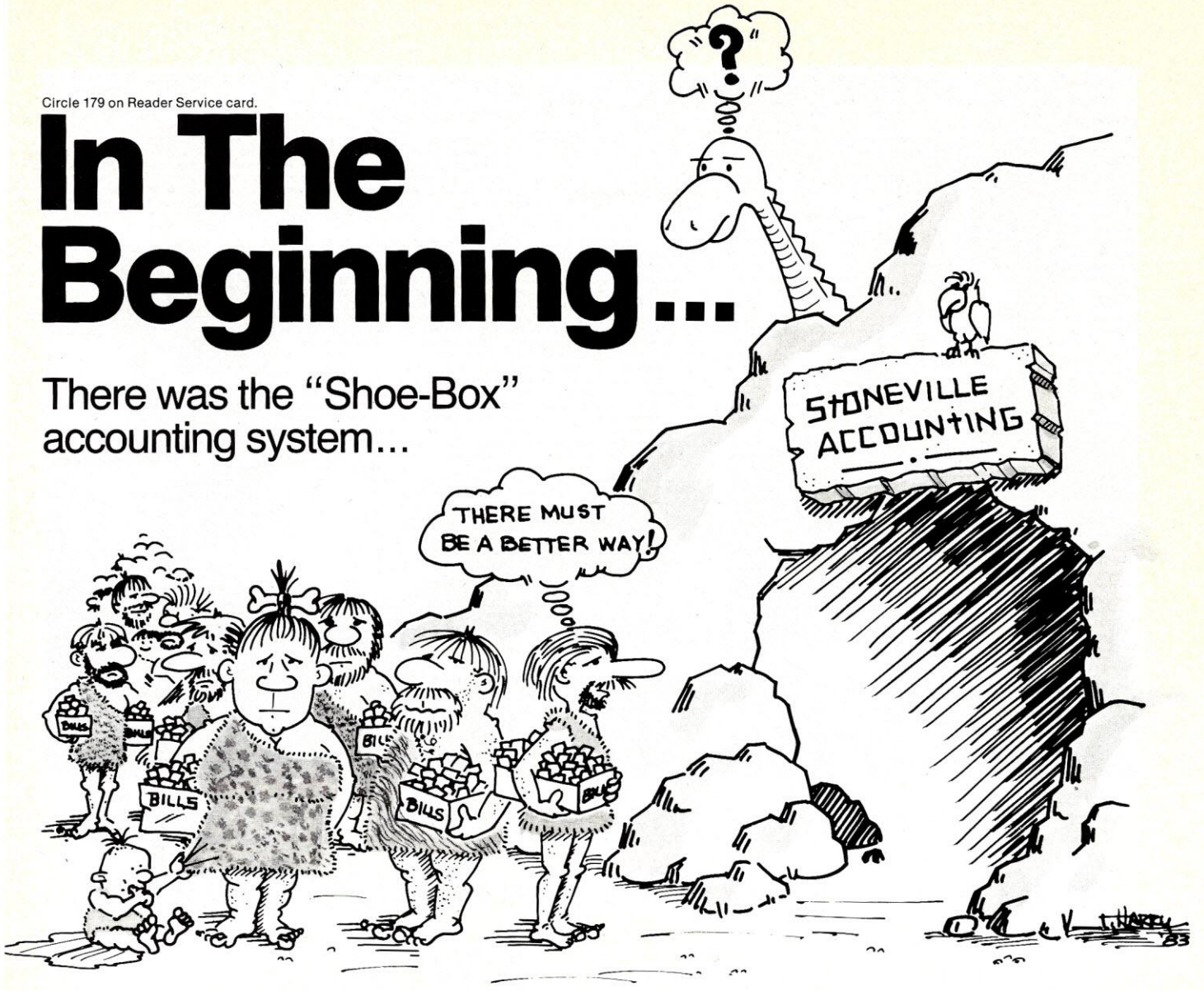
Fig. 1. Block diagram of the TMP Demo board.

Mark Robillard is a Principal Engineer/Program Manager for Sanders/Calcomp in Hudson, NH. He can be contacted at MJR Digital, PO Box 630, Townsend, MA 01469.

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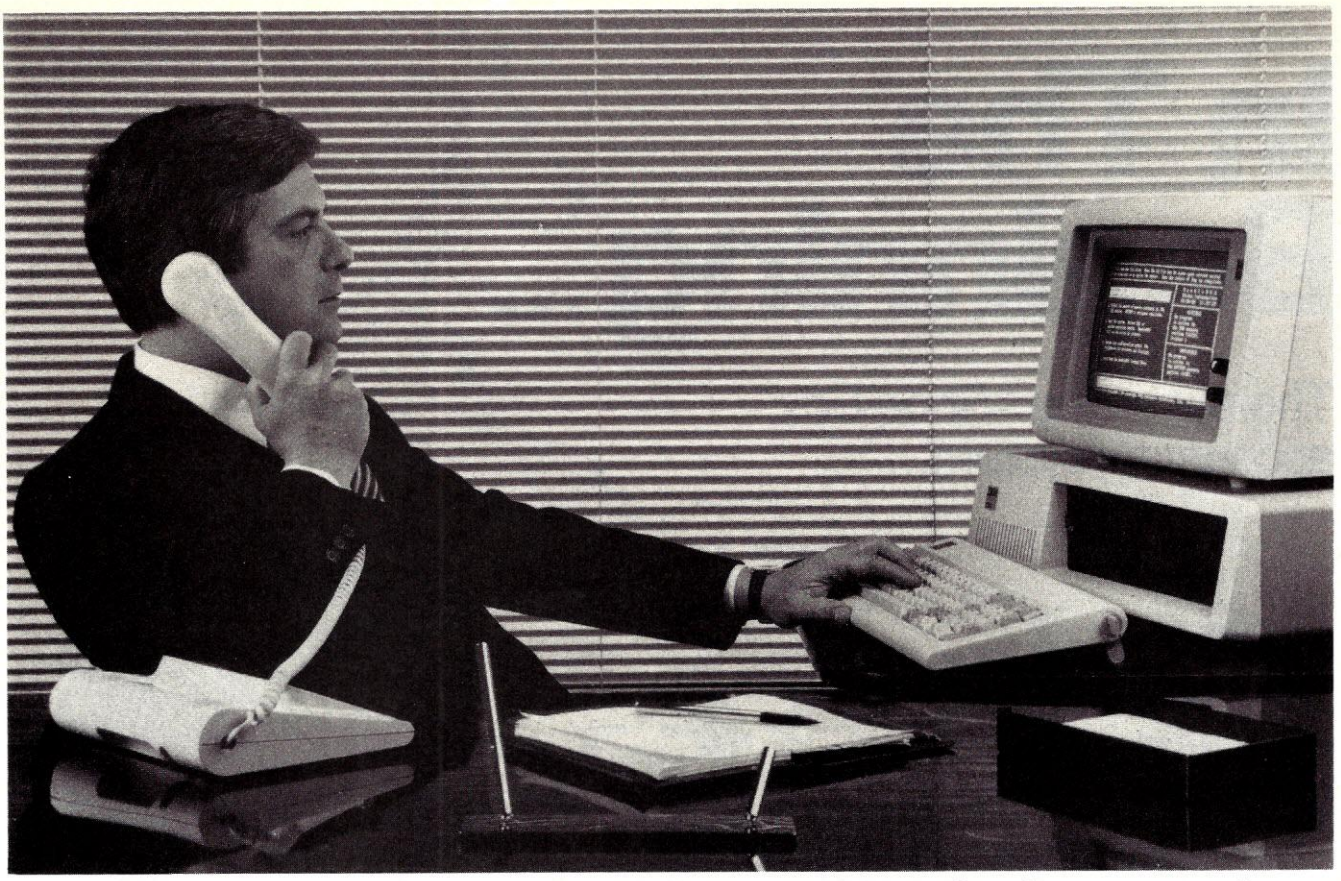
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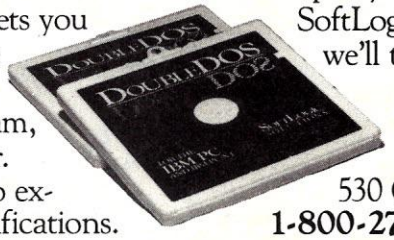
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two vertical lines of three. Through software or command sequences you could selectively turn on or off any combination of the six blocks. This became known as low-resolution graphics.

Soon after, a form of high-resolution graphics, as in the Apple and TRS-80 color microcomputers, became available. Although high-resolution is a misnomer for these relatively crude resolution machines, they were a distinct improvement over the Model I's block graphics.

Pixel graphics next became the buzz word. Pixels (as you will recall from January) are the small elements that make up the dots for the characters. The Apple computer has the ability to turn on or off any combination of pixels, thereby making smooth or fine-line graphics. The name "line graphics" came from this type of technique. Now there are character generator ROMs that provide preprogrammed line graphics characters as well as block graphics characters.

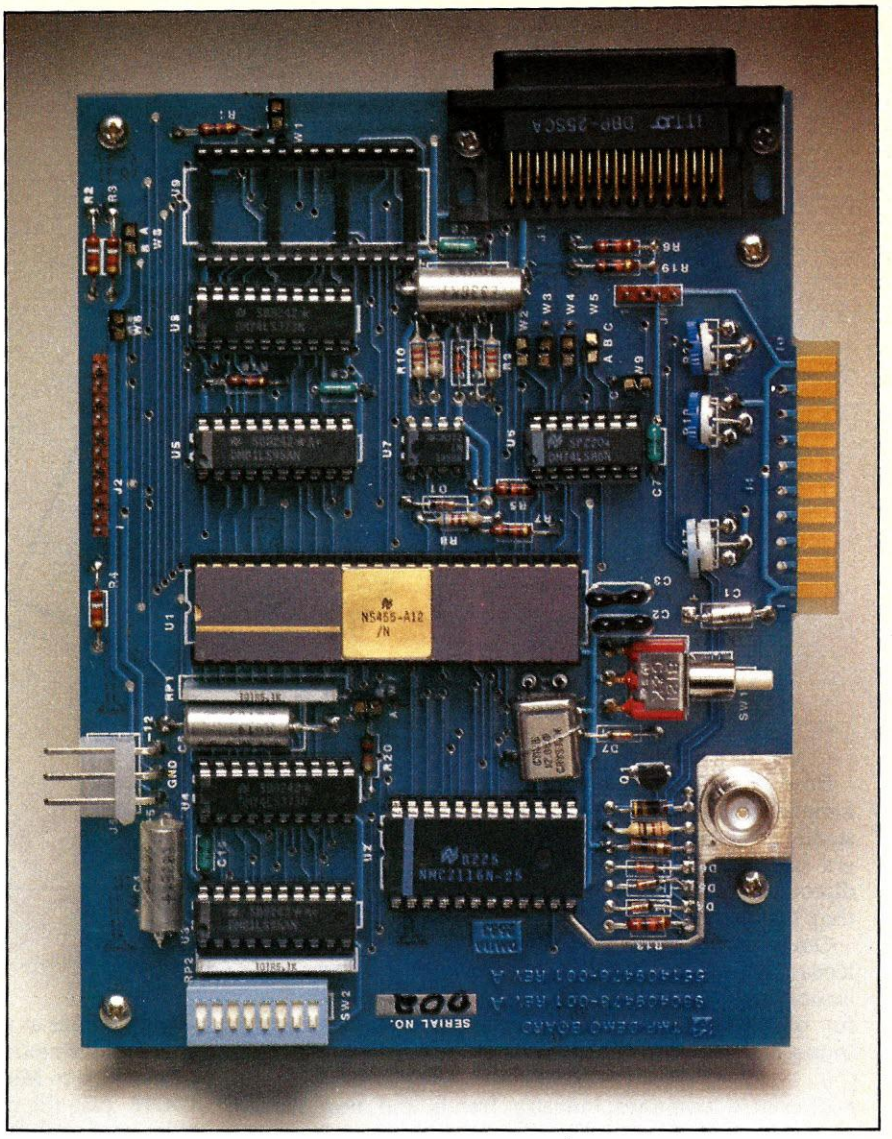
Graphics terminals require a host of control sequences or control codes to allow an external computer to implement the graphics pictures on the screen, just as the earlier alphanumeric terminals required control codes to move the cursor or erase lines. These control codes are now known as escape sequences.

An escape sequence is named for the first character that must be sent to the terminal. In the standard ASCII character codes, escape is known as a control code that has a value of decimal 27. A normal escape sequence showing the decimal 27 coming over alerts the terminal to a control operation coming down, and then a single ASCII character arriving denotes the type of control. From there, any number of ASCII characters may be sent to complete the variables or the argument needed for that particular control. Graphics terminals use many forms of escape sequences to address and turn on or off pixels or blocks. They also use escape sequences to erase the screen or to provide various color sets.

"Oh, Sure . . ."

As you can see from this brief discussion of the characteristics of alphanumeric and graphics terminals, you have to remember and deal with a lot. When you decide to build an alphanumeric or graphics terminal, either one that suits all your needs or one that provides the capabilities of the lower cost, preassembled, pretested systems, you'll quickly find it more cost effective to purchase a unit.

I'm sure many of you out there are saying, "Oh sure, maybe you can afford a $600 Lear Sigler Adam ADM alphanumeric, but on my salary I can't." That's a good point, and I'm not advocating running out and buying a complete terminal. In fact, this is one of the rare times I recommend that you buy a product rather than build it.



The TMP Demo-12 board.

I come from the era when building was the rule; buying was for those less technical. In the case of the NS455 TMP, however, the cost in single quantities of the chip itself and the lack of availability (because it is a brand new product) dictates that it's easier and more cost effective to purchase a board. "What board?" you say. "Is there a board available with the TMP on it?"

You bet! There are two varieties of this board. One is called the TMP Demo-12, the other the TMP Demo-18. The numbers relate to the frequency of the crystal that is driving the chip. They also relate to the resolution on the screen. This month I'll talk about the TMP-12 board. The photo is a picture of the complete terminal electronics with the TMP board.

As you can see, there are only nine integrated circuits. Actually, in the picture there are only eight. The last integrated circuit plugs into the socket shown on the upper half of the board.

Let's go over some of the hardware features and what's basically on this board. Fig. 1 is a block diagram of the TMP Demo-12 board. In the upper right corner, the RS-232C driver and receiver circuits are built into the card. A DB25 delta-type modem connector is also built right into the card. All interfacing to this connector, in fact all modem control signals, are provided by the chip; they exit and enter via this connector. It requires nothing other than a standard modem cable to talk to it. This is your link to whatever host you're communicating with.

On the upper left of the block diagram you see the 2Kb × 8Kb video memory. This provides the screen buffer of 25 lines of 80 characters. Each character occupies one byte of video memory. Also, on the system bus, notice the switch configuration register. This particular demo board has many possible configurations to use. I'll get into the operation of the switch register later.

Moving down to the lower left you see the video output. There are two choices on the TMP board. If you have a Ball Brothers monitor that accepts separate

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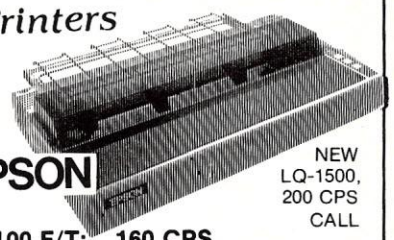


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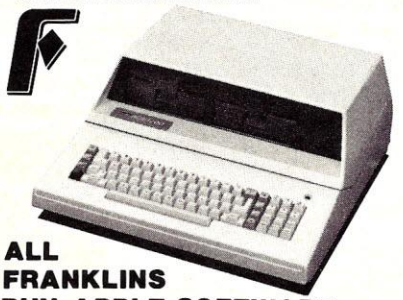
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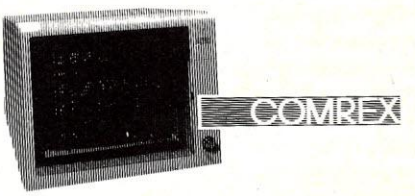
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TTL video signals (that is, horizontal drive, vertical drive and video), the board is designed to use that monitor directly. You'll be able to connect it up to the three outputs provided on the card.

If you decide to use a composite video monitor, much like those now available for personal computers, a circuit is provided on the card to allow it to combine the horizontal, vertical and video signals to provide an industry standard composite video output. In fact, the BNC connector, a standard connection device in video, is provided right on the card.

Moving to the right of the block diagram, you see the keyboard buffer. This is basically an eight-bit buffer chip, an 81LS95, that allows eight-bit encoded keyboard data to enter into the TMP. This will require an external encoded keyboard which is not hard to come by. At the present time the surplus market is loaded with them. Realize, however, that this is not an unencoded keyboard matrix. It requires some circuitry on the keyboard.

Above the buffer you see a box or an optional box entitled External Program ROM. If you recall from the February article, it's possible to program the TMP yourself. The TMP demo board allows you to do this. If you don't want to use the program that's factory-wired into the TMP demo chip, you may plug in your own operating or control program. That's where you use the empty socket on the board that I mentioned earlier.

Big Deal

Now, let's get into the features. So, big deal—it's 4½ × 6 inches and it has all this hardware! What can it do? If you're familiar with the Lear Sigler ADM3A data terminal, it may be well to note that this board not only does everything that terminal does but is much less expensive. An internally masked ROM contains a host of control functions as well as the basic alphanumeric command set.

You can use the external EPROM if you want to design your own terminal program. It displays a set of characters in an 80 column by 25 row display. The 25th row is a status row. This row will show the status on-line, off-line and in various other functions. There are 12 or 18 MHz versions with corresponding 5 × 7 or 7 × 9 character fonts.

There are two different boards—the Demo-12 board or the Demo-18 board. The monitor outputs are Ball monitor or composite video. The board has the ability to work at 50 or 60 Hz.

For you European readers, this may be a welcome sight. It is jumper selectable and will automatically lock to whichever line frequency you select, therefore eliminating any swim or interference on your CRT screen. The RS-232C serial interface with full modem control signals allows you, through the switch register, to run full-duplex communications from between 110K to 19.2K bits per second (bps). There are 24 escape sequences to control the positioning of the cursor and various functions within the terminal, and 15 control sequences.

Now that you have an idea of what the board can do, what the board's size is, what's basically on it and what it looks like, let me tell you that the price is $195. That's not from me; that's from National Semiconductor and full details on ordering this board are given at the end of this article. Is it worth that kind of money? If you haven't made up your mind yet, let's go into detail on the use and operation of the board.

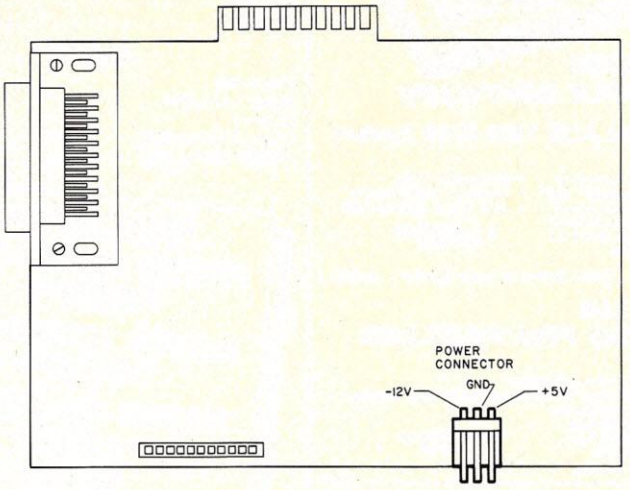


Fig. 2. Connection diagram and physical placement of the dc power source connector.

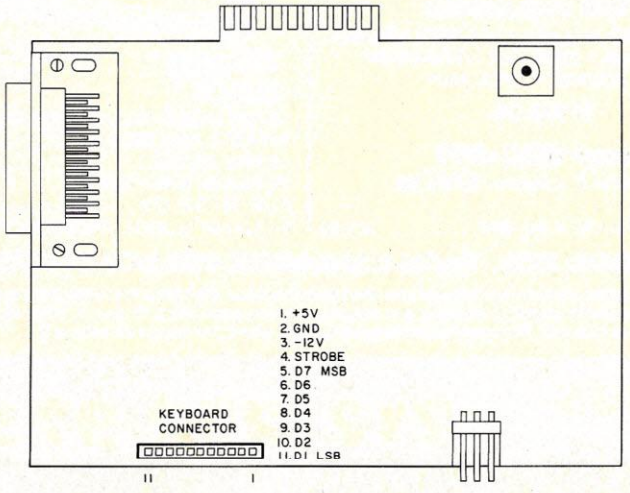


Fig. 3. Keyboard connector and pin out.

TMP Demo Interfacing

Let's start by connecting up the board as you would in building a small terminal system. The first place to start is the power connector. Fig. 2 is a description of the pins necessary and the voltages required for the board. As I promised, the +5V supply is a mere ½ A and the −12V supply is a very minimal 25 mA. The reason for the −12 supply is to provide the RS-232C voltage levels. As you can see from the diagram, a simple three-pin Amp or Molex slide-on connector is used. You can purchase the mating end of this

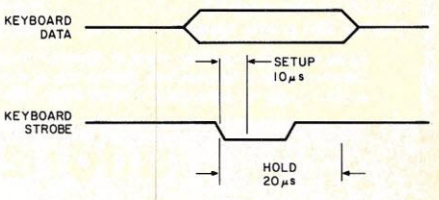


Fig. 4. Timing relationships between the keyboard data inputs and the keyboard strobe line.

connector at any Radio Shack store, and because of the current requirements, small guage wire can be used to bring the power supply signals to the card. In fact, it should be relatively simple to design a power supply for the use of the board.

Now that the power is connected, you have to hook up some way of talking to the board. The next thing should be the keyboard. Fig. 3 is a diagram showing the keyboard connector and its pin designations.

The keyboard input is expecting a seven-bit parallel ASCII code from an encoded keyboard. The row of wire-wrap pins across the edge of the card are centered on 0.1 inch increments. This corresponds to a standard Berg-type connector that can be obtained from many electronics supply houses. Along with the seven bits of parallel data, a strobe must be provided.

Also on this connector, as you can see from the figure, is the +5 and −12V power. This is not an input, but an output to power your keyboard, realizing, of course, that the 500 mA 5V requirement only applies to the TMP demo board. If your keyboard requires an amp or so, you must provide it in the TMP power supply. However, the connector allows for current to flow into the keyboard.

Let's talk a little bit about the strobe. Fig. 4 outlines the timing necessary for the keyboard input. Characters are strobed into the TMP board on each logic low level of the strobe line. The strobe duration may be of any length as long as it has a minimum of 1.25 microseconds. The TMP's internal program will automatically check to see that the strobe line has returned to its logic high state before accepting any new characters.

However, one operational aspect of the board must be noted. You cannot have a long strobe signal without having the autorepeat function. What is autorepeat? You may notice in terminals or even on your personal computer that if you hold down any key more than approximately a half-second, it will automatically start repeating that particular character on the screen. The TMP control program will look for three quarters of a second before it determines that the autorepeat function should be enabled.

When autorepeat is enabled, it will then send out that same character code through the serial port and up to the display at 15 cps. Looking back at the timing diagram, you will notice that the data must be available to be read from the seven-bit parallel lines within ten microseconds after the falling strobe edge, and it must hold at least 20 microseconds after the falling strobe. Most commercially available and even surplus keyboards hold to this spec.

The keyboard data comes in through the buffer IC that I talked about earlier and is read into the TMP. On the board, that particular buffer chip, U5, is in a

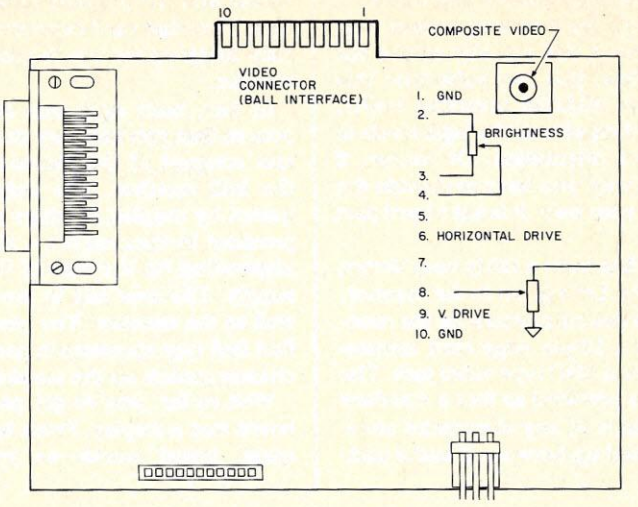


Fig. 5. Video monitor connections.

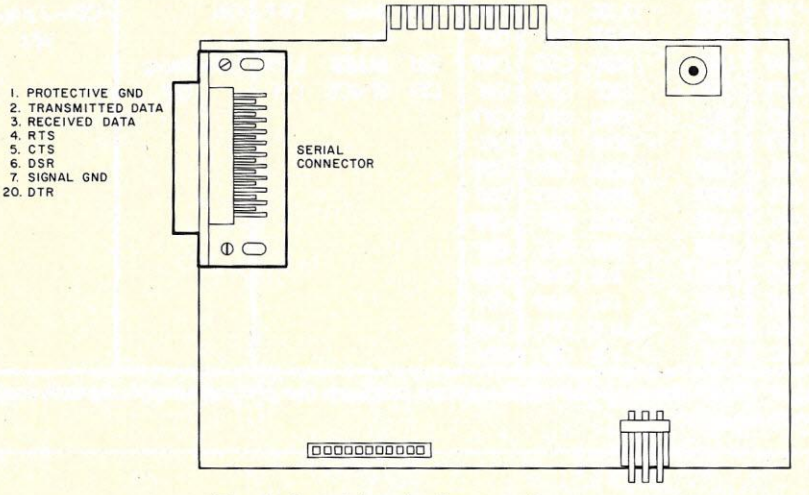


Fig. 6. Serial terminal connections.

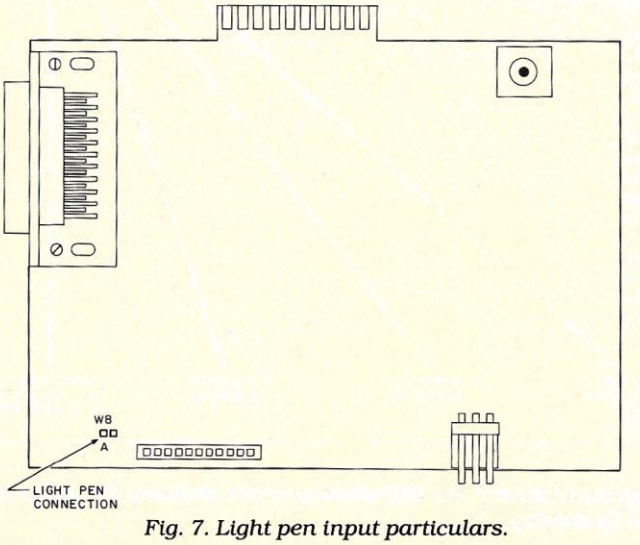


Fig. 7. Light pen input particulars.

socket. The reason for this is that the one provided is a noninverting buffer.

If you have an inverting output keyboard, where a one actually comes out as a logic low, you can substitute this part with an 81LS96 inverting buffer, which will then switch the logic levels to their correct orientation. Of course, if you go this way, you have to provide the 81LS96 on your own. It is not a hard part to come by.

So far, it has been a fairly easy device to hook up to. Let's go on to the monitor.

There are two connectors for the monitor. One is a 10-pin edge card connector, the other a BNC-type video jack. The video jack is provided so that a standard cable, available at any electronics store, can be hooked up between it and a composite video monitor. Fig. 5 shows the details and the pin outs of both connectors. The edge card connector is specifically designed for the Ball Brothers-type monitor.

In fact, built right into the card are pots so that you can vary the brightness and contrast of the monitor signals to the Ball monitor. The only signal required by the Ball Brothers monitor not provided by the card is a +12V or +15V (depending on the size of the monitor) supply. The user has to provide this as well as the monitor. You can frequently find Ball type monitors in packages or as chassis models on the surplus market.

Well so far, you've got power, a keyboard and a display. From here, the terminal board works—as you type in things, characters come up on the screen. Of course, in the local mode or the mode where the keyboard only talks to the display, you can entertain yourself with typing messages that you alone can read. The function of a terminal is to talk to some remote host or other control-like system. That's the function of the serial port built into the TMP board.

Fig. 6 is a diagram showing the outputs and inputs available on the serial interface. As you can see from the list, all signals necessary to hook up to a standard modem or any other type terminal device are provided. This is not necessarily the case on many inexpensive terminal cards. I have seen cards where only the transmit and receive lines are available and no way of handshaking between two systems is possible.

In most cases, this would never work at high speeds where data is being sent from one computer to the next. The TMP board, however, has been designed with problems such as this in mind, and as you can see, they've been solved.

Of Interfacing and Light Pens

On interfacing, last but certainly not least, there is an input to this card that I think will surprise you. I'm not sure if the ADM3A data terminal has this capability, but the TMP Demo board sure does. The TMP chip allows the possibility of being connected to an external light pen. In case you aren't familiar with light pens, let me explain what their functions are.

When using an intelligent terminal, or a terminal that provides graphics or prompting operator-type displays, it is usually necessary for the system to allow the operator to select various options from the screen.

In the case of a graphics terminal, it may be necessary for the operator to manipulate objects on the screen. Using a standard ASCII keyboard to do this type of function becomes very cumbersome, and soon the operator finds it so

8	7		6	5	4		3	2	1
OFF	OFF	4800 bps	OFF	OFF	OFF	Odd	OFF	OFF = Parity	OFF = 1 stop
OFF	OFF	19.2K	OFF	ON		Parity		OFF	bit
OFF	OFF	19.2K	ON	OFF	OFF	Even	OFF	ON	ON = 2 stop
OFF	OFF	19.2K	ON	ON		Parity			bits
OFF	ON	9600	OFF	OFF	ON	MARK	OFF	ON = Parity	
OFF	ON	7200	OFF	ON	ON	SPACE	ON	ON	
OFF	ON	4800	ON	OFF					
OFF	ON	3600	ON	ON					
ON	OFF	2400	OFF	OFF					
ON	OFF	1800	OFF	ON					
ON	OFF	1200	ON	OFF					
ON	OFF	600	ON	ON					
ON	ON	300	OFF	OFF					
ON	ON	150	OFF	ON					
ON	ON	134.5	ON	OFF					
ON	ON	110	ON	ON					

Fig. 8. Chart showing the relationships between the programmable switch configuration pack.

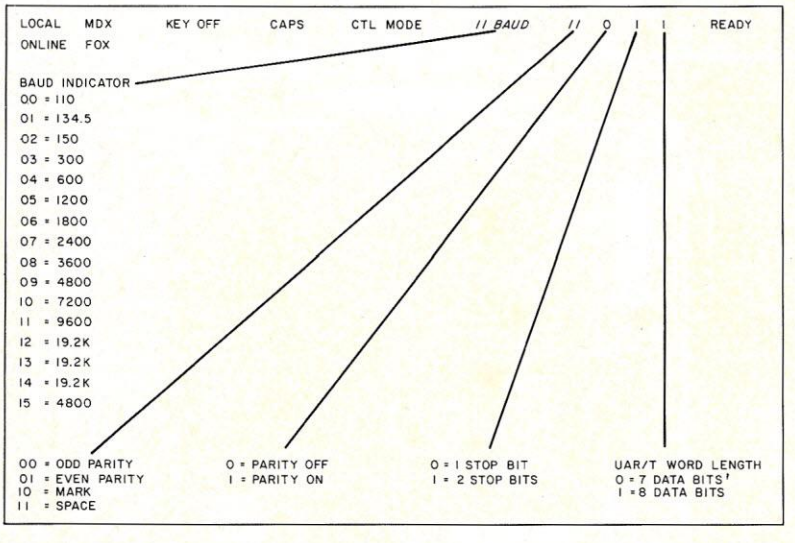


Fig. 9. A representation of the TMP display screen showing the status line and the meaning of its display.

CTL G — BELL
CTL H — Backspace
CTL I — Horizontal TAB
CTL J — Line Feed
CTL K — Cursor UP (ADM3A)
CTL L — Cursor RIGHT (ADM3A)
CTL M — Carriage Return
CTL N — Cursor UP
CTL O — Cursor DOWN
CTL P — Cursor LEFT
CTL Q — Cursor RIGHT
CTL R — Cursor HOME
CTL S — UAR/T BREAK function
CTL T — Increment bit rate pointer
CTL Z — Clear Screen (ADM3A)

Fig. 10. List of control codes available in the TMP system.

tedious, he may not perform the operation.

Several years ago the light pen was invented. A light pen looks very much like a ball-point pen, although somewhat larger in diameter, and is connected by a cable to the electronics that control the terminal. In its tip is a photo-sensitive device.

In earlier years, this was a standard photocell or light-dependent resistor. Now it is usually a silicon photo-transistor. If you recall my January discussion of a raster terminal, each dot is refreshed on the screen as it scans by from left to right. Your eye thinks the dot is on the screen constantly because of the refresh rate. However, the light pen will be able to detect, through its photo-sensor, these peaks of light output as it is strobed across the screen.

Realize, of course, that there will always be some light output because of the phosphor dots implanted on the glass faceplate. However, through analog circuitry and the use of comparators, the sensitivity of the photo-transistor can be adjusted to react only to peak pulses of light.

Internally, the TMP chip has the capability, when the light pen input (a TTL input) is supplied, to latch up the current row and column pixel address that it is scanning. This is no easy feat. By the time the light impulse a) gets through the analog circuitry in the light pen, b) becomes a digital TTL level signal and c) is entered into the TMP, several pixels of scan have gone by. However, the TMP has the ability to adjust for this error in placement.

On the TMP board a small wirewrap pin (denoted as W8) allows an external TTL input from a light pen to be applied to the TMP. The light pen is fully supported in the software that is burned into the control program of the TMP chip. The diagram in Fig. 7 shows the necessary connection

Finally, you have the TMP board connected. It's got power, a keyboard and monitor; it's hooked up to your favorite serial host and maybe even has a light pen for detecting areas on the screen. Now, what can it do, what can you make it do and what can it possibly supply in an application program?

TMP Software Operation

When you hook up the TMP board and decide to use it, the first thing is to configure the jumpers on the board and the selectable switch register. I promised to go over this later; it's now later.

Eight programmable jumpers are on the card, not including the jumper which basically grounds out the light pen signal or allows for an external light pen. The first one (which I will call W7) will allow two different horizontal sweep rates and frame rates for the board. This basically selects an operation between 50 and 60 Hz.

<ESC> A — Toggle Auto Line Feed
<ESC> B — Switch Register Status Line
<ESC> C — Control Mode On
<ESC> D — Toggle ONLINE/LOCAL Status
<ESC> E — Toggle Full Duplex/Half Duplex Status
<ESC> F — Control Mode Off
<ESC> G V — Load Attribute Latch 1
<ESC> H — Restore Attribute Latch 1
<ESC> I — Display Status Line
<ESC> J — No Status Line
<ESC> K — Keyboard enable
<ESC> L — Light Pen
<ESC> M X Y
or —Move Cursor
<ESC> = X Y
<ESC> O — Keyboard disable
<ESC> P — Toggle cursor
<ESC> Q — Run Self Test
<ESC> R — Block send current row
<ESC> S — Block send entire screen
<ESC> T — Erase to the end of line
<ESC> V — Toggle the CAPS LOCK
<ESC> W — Erase the Switch Register Status
<ESC> X — Toggle the UAR/T Word Length
<ESC> Y — Erase to the end of page

Fig. 11. Escape sequences available for the TMP Demo board.

Attribute Bits ON if bit 0

7	6	5	4	3	2	1	0
Block Graphic	Blank	Underline	Double Width	Double Height	Blink	Half Intensity	Reverse Video

Fig. 12. Representation of the attribute byte showing each bit position and its function.

There is an eight-position switch register located on the card. Fig. 8 shows the various conditions of each switch and the functions that it performs.

As you can see in the figure, the first switch programs the serial port number of stop bits. The second switch provides either parity or no parity and, if there is parity enabled, switches three and four determine whether it is of the even, odd, mark or space variety. The remaining four switches allow the selection of one of the fourteen available bit rates.

After selecting the switch combinations that match the serial host you are communicating with, powering up the card will yield a blinking block cursor in the upper left-hand corner and a system status line on the bottom of the screen. Fig. 9 shows a representation of that status line and what each message means for the terminal.

As you can see, whether the terminal is in the local or on-line condition, its mode currently is displayed. Whether it is in the all caps mode or the control mode, the bit rate is indicated by a two digit number. Then the parity and stop bits, and UAR/T word length, which are all selectable, are shown. Of course, the right-hand corner is the ready indication.

Because this status line occupies one of the rows, the data field available is limited to 24 rows. However, through programming, as you will see in the escape sequences, it is possible to replace this 25th line with a data row to give you the full 25 rows.

From here it works basically like any other ASCII terminal. The control and escape codes that allow for special functions can either be entered from the serial port or locally from the keyboard.

As I mentioned earlier, the escape sequence operation is a two or more character transmission with the decimal 27 escape character being the first character sent. The second character must be a capitalized alphabet character corresponding to the function desired. From here, Fig. 10 shows the control codes possible. Fig. 11 lists possible escape codes.

Looking down the list of control codes, many are similar to all other ASCII terminals. The bell code, or control G, allows for a beeper signal that may be

There is no speaker or beeper on this card—that's the only function that National decided not to implement.

60 Hz

0 0 1 1 1 0 0

0 0 1 1 1 0 0

0 0 1 1 1 0 0

2 2 3 3 3 4 4

2 2 3 3 3 4 4

2 2 3 3 3 4 4

5 5 6 6 6 5 5

5 5 6 6 6 5 5

5 5 6 6 6 5 5

5 5 6 6 6 5 5

50 Hz

0 0 1 1 1 0 0

0 0 1 1 1 0 0

0 0 1 1 1 0 0

2 2 3 3 3 4 4

2 2 3 3 3 4 4

2 2 3 3 3 4 4

5 5 6 6 6 5 5

5 5 6 6 6 5 5

5 5 6 6 6 5 5

5 5 6 6 6 5 5

5 5 6 6 6 5 5

5 5 6 6 6 5 5

Fig. 13. A representation of the block graphics character available on the TMP and its bit assignments.

activated from a host or through the keyboard.

You will note, however, that there is no speaker or beeper on this card. That is the only function that National decided not to implement. However, you can latch the bell signal coming out on one of the connectors which would then be applied to an external beeper circuit. From backspace right down through cursor home, these functions should be fairly familiar to you. The UAR/T Break function will make the serial output line space or give a low condition TTL-wise, which usually means a special code in the host.

Looking at the escape sequences available (Fig. 11), let's go down through each command and find the real power behind this card. The first code, Escape A, allows you to toggle on or off an autolinefeed function after a carriage return. This is normally a dip switch configurable type of operation in a terminal.

As you can see, it is all done through the keyboard or from a host with the TMP board. Escape B will display the switch register status in the status line. Escape C will turn the control mode on. The control codes sent into the board are not acted upon as described in Fig. 10, but are processed like normal alphanumeric characters and are displayed as reverse video, half-intensity characters. This sequence erases the switch register status if it was displayed.

Escape D toggles the on-line or off-line status. This also erases the switch register status if it was displayed. Escape E switches between full-duplex and half-duplex communications. If you are unclear on the difference between these two, look back to last month's discussion of various computer-to-computer communications modes. Escape F turns the control mode off where normal control code processing, as shown in Fig. 10, would be provided.

Escape G will load the attribute latch 1 (AL1) with the eight-bit character following the G. This attribute latch is normally used by the status line to do its reverse video, but for this mode the status line is switched over to attribute latch 0 (AL0) thus freeing AL1 for normal text attribute operation.

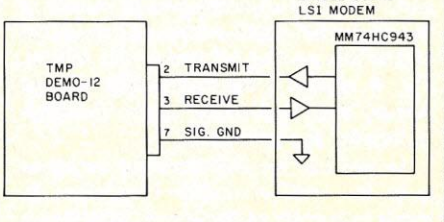


Fig. 14. Connection diagram between March "Techniques" single chip modem circuit and the TMP Demo board.

The operations of each of the bits in this attribute latch are shown in Fig. 12. As you can see, depending upon which bit is on, the following characters then utilize the attributes chosen. If bit 0 is on, any characters following the Escape G and the bit 0 will be in reverse video. Likewise, you can select between half-intensity, blinking, double height, double width, underlined, blanked or block graphic.

The block graphic brings up a good point. How are the blocks mapped in the TMP operation?

Block That Graphic

Earlier I covered the two rows of six blocks in the old Model I TRS-80. It's not quite that easy in the TMP. It is a rather strange arrangement (shown in Fig. 13), which provides the bits or blocks for the graphics characters. A data byte bit location, being a one, corresponding in this block will turn on the areas denoted by its data bit position as shown in the figure. After some study you should be able to see the complex graphics possibilities.

Going back to the chart in Fig. 11, Escape H control sequence then restores the attribute latch to its initial power-up condition. Escape I displays the status line on the 25th row; therefore, only 24 data rows are allowed. The screen is cleared and the cursor is homed to the upper left-hand corner.

Performing an Escape J won't display the status line and will give you 25 data rows. This command also clears the screen and homes the cursor. Escape K enables the TMP board to accept data from the keyboard.

As I stated earlier, the light pen is fully supported in the software on the TMP. The Escape L code returns to the host the light pen registers: horizontal pen and vertical pen, denoted as HPEN and VPEN. These are adjusted binary values and are sent out the RS-232C port with the horizontal value first.

Escape M, with an x and y variable, moves the cursor to that specified x,y position. It's a four-bit character sequence, x is the column position 20–6F, y is the row position 20–37 relative to the home position, which is the upper left-hand corner.

You will note that 20 in hexadecimal is an offset in the number ranges. As an example, the fourth column on the third row from the upper left-hand corner would be 23 hex, 22 hex. This same sequence or command is used in the ADM3A terminals.

Escape O is a keyboard disable which doesn't accept data from the keyboard; however, escape sequences are accepted. Escape P toggles between various cursor presentations. There are four available. First is the blinking block cursor that comes up on power-on; from

there you can move to a solid underline cursor; a blinking underline cursor; and finally to solid block nonblinking cursor.

I suppose if you're a really picky terminal operator, this might come in very handy. Escape Q runs a self-test diagnostic on the board and then performs a software reset. Escape R sends out to the RS-232C port the current row of data pointed to on the screen by the cursor. An Escape S sends out the entire screen's worth of data. This can be very handy when saving the screen to a printer device or possibly to some sort of an off-line storage system.

Escape T will erase the screen or the characters from the screen beginning at the cursor position to the end of the current line. Escape V will toggle a software caps lock function. If you do not have the caps lock function on your keyboard, this will provide you with one.

Escape W erases the switch register status from the status line. Escape X is the selector (you were probably wondering where it was) for the UAR/T word length, between seven and eight bits. Finally, Escape Y erases the data on the screen from the current cursor position to the end of the page. As you can see from the Escape and Control codes available on the TMP board, the possibilities are many.

Where do we go from here? Well, following the sequence of articles from January through March it seems only right, now that the terminal is operational, to touch the world of telecommunications. It is relatively simple to hook up the circuit shown in last month's "Techniques" column to the TMP board.

The connections necessary are outlined in Fig. 14. I have decided not to repeat the schematic of the card; however, I think you get the idea of the possibilities.

Close-Out

I must confess that when I originally planned to write an article on a design using the TMP, I had in mind a proprietary design that I would supply to you. After working with the folks at National and actually getting my hands on a TMP card, I was convinced that it is more effective to purchase the final item—assembled, tested and guaranteed to work.

Let me also explain that when you buy the board, it comes with not only applications information and a more detailed description of what I've given you in this article, but also a multipage, commented source listing of the control program burned into the TMP.

This is something that you don't normally get with a standard ASCII terminal. This commented source listing will help you in understanding how the TMP works and how to provide your own version of the TMP control program in the EPROM socket available.

You must realize that the EPROM socket can take any size EPROM up to 8Kb × 8Kb so you can design your own control system no matter how complex. As I said earlier, it is not the custom of this column to advocate the purchasing of simple hardware. However, in this case I feel it is justified.

Once again, my thanks go out to Bill Kofoed of National Semiconductor for bringing this product to my attention and for the generous use of the card for a two week period. If you decide to order a board from National, specify the TMP Demo-12 card. I believe the $195 price to be accurate, but when this article is published the price may have changed.

Next month, "Techniques" will take on a slightly different flavor. I won't be talking about any one item or theme. A couple of new products have been announced in the personal robotics field, which many of you know is a heartthrob of mine. I will be reviewing these and I will set the atmosphere for an introduction to the next few month's articles. Enjoy your TMP boards, those of you who buy them.□

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- Labels significant to 16 characters even on externals (SLR Format Only)
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- Upper/lower case optionally significant
- Conditional assembly
- Assemble code for execution at another address (PHASE & DEPHASE)
- Generates COM, HEX, or REL files
- COM files may start at other than 100H
- REL files may be in Microsoft format or SLR format
- Separate PROG, DATA & COMMON address spaces
- Accepts symbol definitions from the console
- Flexible listing facility includes TIME and DATE in listing (CP/M Plus Only)

SLRNK

- Links any combination of SLR format and Microsoft format REL files
- One or two pass operation allows output files up to 64K
- Generates HEX or COM files
- User may specify PROG, DATA, and COMMON loading addresses
- COM may start at other than 100H
- HEX files do not fill empty address space.
- Generate inter-module cross-reference and load map
- Save symbol table to disk in REL format for use in overlay generation
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By Thomas Bonoma

MultiMate 3.20 Worth the Wait

Megawriter: A WP That Doesn't Cost Megabucks

I've got a real excursion for you this month, regardless of your pocketbook status after Uncle takes his yearly due. If you're in a low tax bracket or have lots of money left, take a close look at the new release of MultiMate. If you have $100 that the tax man didn't take, examine Megawriter and its spelling utility; it works at a quarter of the cost of the good MultiMate system. Or if you're like me and flat broke, how about a word processor that costs what used to be called a sawbuck?

All this is covered, plus reviews of PIE: Writer's new Speller, the new Sensible Solution release, a 1-2-3 and a Basic tutorial system, and the new Knoware game/training aid.

MultiMate version 3.20

With the release of MultiMate version 3.20 (MM), SoftWord Systems has made a good word processing system nearly great. I held off reviewing MultiMate because it was a competent but not extraordinary word processing system in its earlier version. Significant revisions were said to be in the works, including the addition of a spelling checker, and many other packages were competing for the available ink. Well, delay no more—this is one you definitely want to look at and probably want to buy!



The MultiMate package, version 3.20.

MultiMate is a page-oriented word processor. Pagination is not fully automatic, but occurs only when you indicate that it should. MultiMate is more like a writing tablet than a computer—a comfort once you adjust. MultiMate is function-key driven and laid out in a logical easy-to-learn fashion. To go to the end of the screen, you hit End; to go to the end of the page, hit CTRL-End.

You move the cursor by word, line, screen and page. Text is inserted or deleted using these options; sentence and paragraph choices are supported as well. Cursor moves and range marking are simple because of MultiMate's highlighting feature; you don't deal with block markers when you move text. You just point with the cursor and the chosen text is highlighted by emboldening.

Other usual features (e.g., copy, search

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and replace) that you expect from a word processor are implemented on MultiMate. Text indentation is done with a single key. Headers are called in the same way; even/odd splits and automatic page numbering are supported. These functions all work smoothly and without error.

I'd like to see some other features, like automatic footnoting, automatic indexing and automatic list numbering; these are small but important omissions. I'd rather concentrate on some of MultiMate's unique features.

Featuring Its Features

Within the processor itself, I've singled out five features: merge printing, key procedures, libraries, column manipulation and the speller. Outside the processor, MM's document screens, print utility and some MM utilities, in addition to its dual command structure, will be scrutinized.

MM's merge print function is competent but requires too much of the user. You have to identify each field in each record in the data file with special opening and closing identifiers and the symbolic name of the variable. Every record in the merge file has to be on a new page, requiring more keystrokes. While much of the tedium in this system can be automated, it still is difficult to use.

Version 3.20 of MultiMate does include "key procedures"—the ability to record to disk any sequence of MM keystrokes, then play them back at will. Using this procedure, merge file creation becomes simple. Key procedure files have other uses, like automating format line changes in the text—a nice addition.

MM's library attachment feature is carried over from version 3.11. Library documents can contain anything... phrases, words or even frequently used forms. A return address is a good example. Library documents are created separately from other text documents, then attached to these documents. This system requires exiting the text document you're using, reentering the text document, attaching the library and using it.

Of course, you'll quickly create a standard library, but until you do, the exit and create and attach cycle is a disincentive to broadening library files and not as workable as Microsoft Word's glossary function, for example.

Column manipulation in MM 3.20 is a joy. In addition to decimal tabs, good column insert, delete, copy and move commands, MM permits horizontal and vertical column addition and subtraction. The most frustrating part of word processing is often column layout; very few processors do it well. MM really shines here, and it also allows some rudimentary column math.

Spell It Right

Version 3.20's biggest claim to fame is its speller, which works both from the MM main menu and from within documents. The latter function is the more interesting. You can check a word, sentence, paragraph or the entire document with a single keypress. MM marks words it doesn't recognize and counts both words and misspellings. With a second keypress you can step through the text, have MM suggest corrections from its 80,000 plus word dictionary and then automatically make them.

Where does MM place? Close to the top in my book. It's a full-function, no-nonsense, get-the-job-done program with spelling abilities... you'll be buying a near-dedicated word processor.

The bane of spell-checkers is speed, so here are some benchmarks. The previous paragraph took 21 seconds to spell-check and the speller found seven "errors" (like the word keypress) it didn't recognize. Stepping through these to clear the marks put in by the speller took another ten or 15 seconds. Checking this entire section took two minutes and 32 seconds for 908 words, finding 16 suspect ones (only one was an error, which I planted—MM found the correct spelling for "delaye" and inserted it).

The checker isn't quick but it is adequate. The in-document facility means you can check suspect words as you type them, so errors are caught as they're made. I like it. My only gripe is the lack of a facility in the check corrector to ignore a suspect word throughout the document (like all the MM abbreviations in this section). You have to (tediously) check and unmark each one.

Scrutiny No Threat

The MM system's document summary screens and easy menu-driven operation show up favorably under scrutiny. When you create a document with MM, a form that allows longer than normal filenames and several other pieces of information is filled in. The beauty of this system is that a utility, callable from the main MM menu, lets these screens be searched for, say, all the letters you wrote to *Microcomputing* this year. Nothing is worse than staring at a disk directory and wondering what "CMPTR01.TXT" means. With MM, you'll never do this again.

Finally, MM's command menu and manual are miracles of clarity and utility. The manual, currently in two pieces, will soon be replaced with a new integrated one. The menu of commands available can edit an old document, create a new one and print your document (including background printing, queuing and a wide range of supported printers and sheet feeders).

MM can merge print ("mail merge"), search your document summary screens and engage a variety of other utilities (such as one to incorporate .DIF and ASCII files) or copy, rename and delete files.

There is even a document recovery utility which can correct lunched documents for you. (I used it once to save a 15-page document.) All commands are accessible from either menu screen from within your document itself with Alt plus another key. This dual operation mode is suitable for novices and experts alike, leaving the writing screen uncluttered for easy editing.

Almost Number One

Where does MM place? Version 3.20 brings it close to the top in my book. It's a full-function, no-nonsense, get-the-job-done word processor with spelling abilities. The manual is well-done, the training lessons are sophisticated and you'll be buying a near-dedicated word processor for the price of a piece of software.

Megawriter and Megaspell

At the other end of the price range, Megawriter is a new $99 word processor for the IBM PC. It couples the advantages of the UCSD p-system text editor with significant additions to form a full-featured word processing system at a minimum price. Those who grew up with the Pascal text editor recognize MegaWriter as one of the most flexible and powerful text editors around. Oh, it won't give on-screen underlines or emboldening, but it does its job quickly, reliably and powerfully.

To insert text, you type an I and go to it; to replace (typeover) text, an X (for eXchange); and to copy, a C. To stop any of these things, use the End key. The editor has markers, manual reformatting capability and even undo abilities because all deletions are copied to a buffer rather than discarded.

Coming Out of Its Shell

Megahaus made changes of its own to this simple and powerful system and then surrounded it with a solid "utilities shell" that makes life easy. Within the editor you can define nine of the PC function keys as macros. In-text formatting commands are available as well, i.e., just-

ification, emphasized print, headers (single line only—no footers because this space is used for page numbers), margin adjustment and underlining.

Six commands are user-definable, so you can implement the special features of your printer, like color. Very nice! How about a reasonably easy-to-use full mail merge capability as well. . . this in a system costing less than $100?

But it's outside the editor that Megahaus added the most valuable features for both novices and advanced writers. The "organizer" system, with its built-in scanner, allows cataloging, backing up, renaming and a host of other utility features to be performed within the program in an easy manner. To copy all files that have not yet been backed up to another disk, for example, you just choose them by pointing the cursor, typing B, and letting 'er rip! Finally, a way is here to raise the probabilities of backup over the zero percent level.

The scanner has other unique aspects, such as a built-in file archiving function. Each file can have a one-line description attached to it that is displayed by the program whenever the cursor points to that file's name. This way, you always know what "REVSP" means, even a year after writing it. A good print-time formatting menu, which can change page formats and the like, is also provided.

I found no flaws in the software; it performed quickly and reliably. It's well worth its price. Indeed, if you consider the mail merge and truly innovative organizer functions, it's probably worth more than that. On the negative side, the program is written in UCSD Pascal, making file compatibility with DOS difficult. But if you're a Pascal user or a novice who likes to make his computer do writing, take a look at this package.

Megaspell Megaslow

I can't be as positive about Megaspell, the companion spelling program that sports a 40,000-word dictionary. While the program is well-done, I found it slow and awkward to use. Correcting a file as long as this section took more than seven minutes (3½ just reading the file and the dictionary!).

The speller is separate from the main menu of the word processor. You have to reboot the system to use the speller, a major disadvantage. Since the speller has the same organizer feature as the Megawriter, finding files to spell-check isn't a real problem. The dictionary doesn't recognize most possessives, contractions or other common word endings, which makes the program stop often. Room to add only 10,000 more words to the dictionary is an unnecessary restriction.

The program also beeps every time it identifies a misspelled word, an annoyance to others. A word added to the dictionary can never be deleted. After you've made a correction, the program checks the correction against its dictionary. That's good, but then it asks if you're sure even if it has confirmed the correct spelling, a disconcerting feature.

I understand Megahaus recently released a database manager to go along with these other products; I'll look at it in a future column.

Here's PC-Write's deal: You try the program, have an incentive to register it and can amortize the cost of registration over just three registered users.

```
Press F1 to print screen, or Esc to cancel                              #
Modifier keys: ^ Ctrl, * Shift, @ Alt.   +Fn: Means Fn with Ctrl or Shift or Alt.
 F1. Show this help;  exit, save, read   +F1. Exit, save, read  (no help shown)
 F2. Edit ruler line, split/join window  +F2. Read ruler line from file
 F3. Copy marked, to file if marking     +F3. Insert file at cursor
 F4. Move, to hold if marking (cut)      +F4. Insert hold at cursor (un-cut)
 F5. Clear all marking                   +F5. Marking through next word
 F6. Switch between marking and marked   +F6. Marking through current line
 F7. Reformat paragraph from cursor      +F7. Turn justification on or off
 F8. Change case, of letter or marked    +F8. Center line or marked, in margins
 F9. Set find and replace text           +F9. See and change cursor line number
 F10 Replace found text                  +F10 Un-replace, or Replace to end
Find/replace matches: F5 alpha/number, F6 all other, F7 anything, F8 line bound.
 Tab..... tab forward       Ins..... space in, push  *Ins..... redo Ins's, down
*Tab..... tab backward      Del..... del char right  *Del..... redo Del's, down
 Esc..... insert an esc     ^Esc..... cut word right  *Esc..... transpose right
 Bksp.... del char left     ^Bksp.... cut word left   *Bksp.... transpose left
 Enter... new line insert   ^Enter... cut to end line *Enter... new line, align
 NS arrow up/down line      ^Grey*... redraw screen   *NS arrow top/bottom edge
 EW arrow left/right char   ^EW arrow left/right word *EW arrow left/right margin
 Hom End. col one/end line  ^Hom^End. save/goto place *Hom*End. beg line/end col
 PgU PgD. scroll one line   ^PgU^PgD. prev/next parag *PgU*PgD. scroll window
 ScrLock. Push/Over mode     Grey+-.. find next/back  *Grey+-.. start/end text
 Keypad 5 Ctrl next key      Grey*... Shift next key  *Grey*... print screen
```

Fig. 1. The help screen from PC-Write. Note the complete command set and thorough integration of key choices.

PC-Write

PC-Write is a new "shareware" word processing program written and marketed by Bob Wallace at Quicksoft. It runs in either monochrome or living color, has a separate print formatter and lives up to its claim of being "small, fast and reliable." Actually, it delivers more than its claim in many areas, offering all standard word processing features plus split-screen editing, transposition and case-reversal keys and more. I've reproduced the help screen from the edit program in Fig. 1. I'd like to talk about what Bob Wallace is trying to do, and why you should consider supporting his program.

Good Deal

Here's the deal. You send Quicksoft $10 and they send you the entire word processing program and the manual (on disk) and encourage you to copy it and spread it around to your friends. They ask that you register your copy by sending $75 registration fee to Quicksoft after the value of the program has been proven to you. You then receive a nice binder and printed copy of the manual, the registration number and notification of updates.

You also join the "commission shareware." After you put the new registration number on your disk, any copies you give away that result in subsequent registrations generate a $25 commission for you. This is a one time payment per registration.

In this deal, you try the program before you use it, have an incentive to register it and can amortize the cost of registration over just three registered users. Of course, if you don't like the program, don't send the $75!

I have a real problem with commission schemes, but this one seems useful to both users and programmers. Under ordinary "freeware," like my Desktop program, it's rare to find more than one in two users who pay for the program with a suggested donation, even a small one like $20. You have to double the number of copies needed to be sold in order to amortize the costs of programming, labor and the like.

With Wallace's concept, the registration fee is large enough to cover four or five more $10 gambles, while your own registration at least has a chance of being repaid. You won't part with the $75 unless you really believe PC-Write is a quali-

ty product. What the heck? For $10 it's worth a try!

The Speller for PIE: Writer

Several columns ago, I wrote about the good born-again word processor for the PC, PIE:Writer. This system, which runs in either 64- or 128Kb machines with either monitor, has a myriad of features. In that column, I suggested that PIE:Writer has no on-line help facility. The developers have gently but firmly reminded me it does, and it is called by an ESC-H from the keyboard.

What I want to tell you about this month is the spelling checker Hayden has released, The Speller. The Speller works in one of two modes: as an integrated menu choice from the main menu or edit screen of PIE, or as a stand-alone spell-checker configurable for Volkswriter, EasyWriter, WordStar or generalized ASCII use.

Since there are other products you might choose for these latter systems (The Word Plus is one of the best), I'll concentrate on The Speller's use with PIE:Writer.

A straightforward configuration program automatically merges the speller with PIE, on double-sided disks. The Speller is then available from the PIE menu, or while editing files, to check your spelling. A 20,000-word dictionary, supported with supplemental dictionaries you can create, is on call. Like most spell-checkers, The Speller won't handle errors in syntax, grammar, semantics, capitalization, hyphenation or one-letter words. All words over 19 letters are ignored (it's unusual to see antidisestablishmentarianism in a text file).

When called, The Speller gives a directory of text files, reads the file and compares the words to its dictionary. Then the fun begins. You can Display the suspect word list, Print it, Check it word by word, Scan through all the suspect words in your file shown in context and make corrections in them, Use a supplemental dictionary, Review previous choices and Exit the system.

When you are scanning (the most frequently chosen option), you can Accept (ignore) a given word and it will be ignored in the rest of the file, Accept it and add it to a special dictionary or a word file named after your text file for later dictionary additions, Review past choices, or Postpone action on a given word. This last choice is especially welcome for names that might be spelled differently in different parts of the file.

I was pleased with the performance and ease of use of The Speller. Given a one-error, 3000 plus word file, The Speller read it in just under five seconds, checked its dictionary in another one minute, ten seconds and identified only 23 potential misspellings like "PgDn" that I had to check out manually and OK for keeping. It also correctly found the one spelling error I intentionally placed in the file. Only five words (e.g., formatting) had to be added to the dictionary.

If I compare these numbers with SpellStar from MicroPro, they'd look like 60–70 potential misspellings identified and eight to ten dictionary additions. These comparisons are important. The less the spelling program bothers you about possessives, word endings and the like, the more you'll be able to concentrate on spelling instead of teaching the program what it should know in the first place.

The Speller was exceptional in this regard, doing more with a 20,000-word dictionary than I can do with my 60,000 plus SpellStar one. If you have PIE:Writer, buy it. If not, look at it anyway—it's configurable for many systems besides PIE, and works well indeed.

Gregg Andreasen took extreme exception to my TSS review, so I've decided to take another look . . . If I were awarding points for correctness, I'd give him six and myself four.

The Sensible Solution (Revisited)

Several months ago, I reviewed The Sensible Solution (TSS) less than positively. I complained about the program's "awesome complexity," including the tutorial, and that the system's commands made it hard to use. Gregg Andreasen of O'Hanlon Computer Systems took extreme exception to my review, so I decided I'd take another look at TSS, this version (1.24) with improved documentation.

Andreasen was right in several of his criticisms of my previous review. First, there are only 65, not 200, commands in TSS. I made the mistake of assuming that since commands were numbered up to 200, some were missing.

I also said the program didn't have default operations. Andreasen points out that TSS automatically will build a file maintenance program from just a screen layout (itself a semiautomated process) that saves, searches, updates and deletes records on as many as ten index fields. True again, though for custom applications the user needs to get inside these automatically constructed files and change them somewhat to detect duplicate keys by adding TSS' commands to the file automatically generated by the program.

The nature of the controversy revolves around our respective degrees of comfort with TSS' procedural language and the commands (e.g., CK.DUP.KEY or BLNK.LNS) that TSS partially writes from your data screen and you partially insert into the resulting command files to complete the DBMS application. Andreasen, apparently comparing the language to Cobol, finds it easy to use and simple to understand. I, who come from either a less flexible or more demanding point of view (and no recent mainframe experience), found TSS' language initially hard to understand.

Much of the difficulty disappears with the new documentation and also with continual use. TSS' screen design feature gives you a paint-by-numbers way of creating data files. You can do a whole lot with them, even without learning the procedural language. Its quick report feature works as well as any I've used, a major plus.

All of this is automatic and requires no programming ability on the part of the user. If you're willing to learn some commands, you can link multiple files, create a full general ledger system and outperform many other databases with fewer commands. Best of all, while you're writing the command files that will drive your application, the whole process is automated by virtue of TSS' unique command names and immune from syntax errors. You just type in command numbers rather than the commands themselves.

Finally, once the application is written, it is transparent to you and to the user, who needs no knowledge other than how to push a key from a menu and use control-code combinations on the keyboard.

I think if I were awarding ten points for correctness, I'd give him six and myself four. Without the new revision, it would be a flat five and five. TSS is an interesting DBMS/program generator for newcomers who won't want to learn its programming commands and for experts who will. The program's ability to grow with the experience of the user is a major plus.

Briefly Noted

Letterform 1000 is a five-disk package containing a variety of business letters

that you can adapt with your own word processing software. The Letterform manual contains a listing of abbreviations, headings and conversion tables. LF's seven sections contain letters on accounting and collection, employer and employee matters, goodwill and sales letters, legal forms and some agreements, shipping and ordering correspondence, personal letter writing and fund raising and community activities.

As with any package of this type, some of the letters are stupid, some adequate (like a form for a promissory note), and some invaluable; all need modification to be customized to your needs.

Some LF letters read as if a manager had just dumped his correspondence file to disk. Letter 3113, for instance, is marvelous if your watch, included with the letter, was purchased on November 2, 1982, and now won't keep accurate time. Otherwise, it will require rewriting before you can use it.

However, if you find just ten or 20 of LF's letters, forms or other templates suited to your needs, you'll have saved yourself hours of work. If the templates remove you from a sticky situation (you don't know what to say to that good friend who won't pay his business bills), the package will have paid for itself many times over. The table of contents and the hard copy reproduction of all letters in the manual make such a save likely.

A Boost Up the Ladder

A package that should go somewhere is Knoware (KW). KW is a well-done tutorial on how to use the IBM PC and common software, disguised as a game. Your goal: to climb up the corporate ladder to chairman, investing your salary and bonuses simultaneously in order to earn $1,000,000 before you are 60 years old. KW's job: to teach generic applications like word processing, database management, spreadsheet analysis, graphics and even Basic programs so you won't be afraid of them. There's no pretense that KW will teach you to program; rather, it teaches you how to use canned programs and does it well.

Your various bosses on the corporate ladder set tasks, such as figuring out what day of the week a fellow employee's birth date falls on. To find the task, you must enter the word processor (Knoword), retrieve a file with the memo from the boss and exit. Then, knowing the employee's name, you enter the corporate database (Knowdata) and look up the guy to find his birthday.

Next you call up a program, Calendar, which takes in dates and gives back calendars of the month in question. The retirement clock ticks away while you're doing this. Each time you complete a set of tasks, you get a cash bonus that you can invest (you have to manage an investment portfolio, too) and sometimes a promotion up the management ladder.

You might think any program that does such a good job of teaching and game-playing would have worthless lightweight programs as the object. Not so—Knowdata, Knowcalc and Knoword aren't full-function programs, but they serve quite nicely for the beginning user.

I recommend Knoware strongly to anyone new to the IBM PC or fearful of it. You won't be after a few hours with KW—it's a well-done tutorial disguised as a game.

The best part of Knoware is that after you play the game and become sophisticated, you can use the applications as stand-alones and add them to your program library. The graphics program, for instance, produces useful bar and pie charts (with percentages) from either stored or keyed data—it is a good, working program. The same can be said for the other routines on the disk (like a biorhythm program and one to do financial calculations—mortgages, future values, and so on).

KW also has good graphics and sound, a must for effective learning. I recommend this program strongly to anyone new to the machine or fearful of it. You won't be after a few hours with Knoware—in fact, you'll be ready to tear up at least the basics of commercial spreadsheets, databases and word processors!

Friendly Thoth

Thoth is billed as an action list database manager. It runs in either color or monochrome, has password protection and maintains three databases.

The first, Action list, stores items by data and priority. A free text area is provided to enter your item but there is only partial wordwrap in this area, making text entry cumbersome.

The second, Notes, consists of a form similar to the Action list. Here the messages are stored by category, a seven character free-form field chosen by the user when each item is entered.

The third database, People, has room for the name of person, business and home addresses, six labelled and user-definable categories (e.g., friend, relative) and notes about the entry. An interesting feature is that entries on the Notes and Actions databases can be linked to as many as seven different people, so that when you call up the Action item or Note you can cross-retrieve the people you have identified as relevant to this item. A nice feature.

Thoth is fast, even on floppy disk, simple to use and exceptionally friendly. A facility to reconstruct the key file, should you exit Thoth in an untimely manner, is called automatically the next time you run the program.

However, there are some features the developers omitted from Thoth that would make it a more full-featured system. First, while the cross-referencing feature is fine, it is incomplete. Notes and Actions can be tied to People, but People forms cannot be tied to Notes or Actions.

Secondly, and more seriously, you can't search the Actions database by priority, description or anything other than date. You can't search the Notes database by anything other than category either. For instance, you can't search the free-form text areas of the forms for a particular entry, phrase or description.

Strangest of all, you can't search the categories where you're supposed to file people on the People database. You are limited to last name (and partial name) searches. I find these limitations problematic because they limit the product's usefulness.

Calling Thoth a database manager is an overstatement. It manages three kinds of lists and links two of them with items from the third. It does this well, though the manual is exceptionally light (partially made up for by a disk tutorial). Thoth could be revised without changing a single one of its good forms to be a much more powerful program. Right now, it seems to short the user on power in order to be his pal.

Useful Package

Controlling Financial Performance for Higher Profits is one of a number of business-user guidebooks and disk packages that have been appearing from Curtin and London, Inc. The three books that I've looked at in this series (the one mentioned above plus two VisiCalc ones) have been uniformly well-done and are useful aids to the manager.

CFPHP starts all the way back with the parts of the computer system you'll need and moves you through income statement and balance sheet analyses in interesting ways. The standard ratios (e.g., liquidity) are explored, as are some sensitivity analysis techniques using 1-2-3's data table function.

In every case I worked through, the instructions were clear, the keystrokes apparent and the output illustrated as both text and graphics. You can compare your results with those produced by the authors. Often, applications packages languish because users just can't figure out what to do with them. The authors of

CFPHP have written a good book that provokes better financial analysis and at the same time helps the reader develop skills in manipulating the powerful 1-2-3 package.

Program Rich, Assumption Poor

The Executive's Guide to the IBM Personal Computer: BASIC Programming and VisiCalc (TEG) was written and programmed by a Florida International University professor and is marketed by Reston Publishing Co. Boxed in an IBM-sized three ring binder and containing two disks, TEG spends ten of its 11 chapters on Basic programming; the other is on VisiCalc. Conclusion: Don't buy this book to learn VisiCalc. Let's look at Basic programming.

The author makes some interesting assumptions. If you accept them, he does a competent job of teaching managers how to manipulate inventory files and programs, sales statistics and personnel accounting. The assumptions are: it is better to organize a book teaching executives to program by programming function (e.g., writing sequential files) than by what needs to get done (e.g., doing sales reports); and executives want or need to learn to program.

If you accept these two assumptions, Parker has written a fine book that puts managers past the novice stage of programming to where they can manipulate the Basic language competently (but not using graphics or many other PC Basic enhancements). Doing calculations in Basic, data entry, sequential file entry and retrieval, lists and tables and random access files all are covered adequately with managerial applications. The book is rich in programs, all preentered on disk.

It's the assumptions I find problematic. The managers I work with usually don't want to know programming at all, and if they do, want to know only enough to get a particular job done. Had Mr. Parker agreed with my assumptions, his book would have looked very different indeed, both in content and in organization. I'll let the market see who's right.

Coming Up

Well, next month, for sure, we'll look at Execuvision, along with two new releases of Select, a Writer's Pack for WordStar and the second-generation releases of a couple of popular packages. Perhaps the heavily advertised Open Access will have arrived as well.□

The "Big Blue" Black Book

Prices and Addresses of This Month's Featured Products and Companies.

Controlling Financial Performance for Higher Profits
$40.50, VisiCalc disk and book
$29.95, 1-2-3 edition disk and book
Curtin and London, Inc.
6 Vernon St.
Somerville, MA 02145

Executive's Guide to the IBM Personal Computer
$49.95, two disks and looseleaf book
Reston Publishing Co.
11480 Sunset Hills Road
Reston, VA 22090

Knoware $95.00
Knoware, Inc.
301 Vassar St.
Cambridge, MA 02139

Letterform 1000 $95.00
PBL Software Corp.
PO Box 599
Wayzata, MN 55931

Megawriter and Megaspell
$99 and $59.95
Megahaus Corp.
5703 Oberlin Drive
San Diego, CA 92037

MultiMate Professional
Word Processing System 3.20
$495.00
SoftWord Systems, Inc.
52 Oakland Ave. North
East Hartford, CT 06108

PC-Write $10.00 for the disk
Quicksoft
219 First N. #224
Seattle, WA 98109

Speller $49.95
Hayden Software Corp.
600 Suffolk St.
Lowell, MA 01853

Thoth $99.95
XOR Corp.
5421 Opportunity Court
Minnetonka, MN 55343

Circle 283 on Reader Service card.

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By Frank Derfler, Jr.

Graphics Software Comes of Age

Popcom: A Thoroughly Modern Modem

Welcome to Overview. This is the column that tries to climb above the shuffling crowd to see where the pack is headed. This month, I'll look at a great new device that I believe marks a new trend in modems and I'll make a few observations about Macintosh. But first, let's conduct a little study on the evolution of software, using graphics programs as an example.

On Graphics

It is surprising to see how long it takes to develop good software. Hardware capability leads software development by years. One good example is the area of graphics programs for the IBM PC. The PC is now well over two years old. When it came out, its ability to produce color graphics was highly praised, and many people commented on the value of this ability in the modern office. But only in the past few months has graphics software come out that meets the needs of business people who rely on the performance of the software to make a living.

Three packages—Chartman II, Cadplan and Energraphics—provide flexible professional graphics capabilities. These programs don't serve identical markets, but they share some common features and they have about the same degree of sophistication. Chartman and Energraphics concentrate on giving you the ability to quickly and easily make superb-looking pie, bar and line charts. You can produce the charts on screen, on dot matrix printers or on plotters. You can use Chartman to produce nice-looking signs and charts containing many words written in different styles of script, but Energraphics can create some spectacular three-dimensional bar charts.

Cadplan is a program that helps you create drawings, such as schematic diagrams, architectural plans and illustrations. It contains many helpful functions that give you flexibility in making drawings and perform automatic chores, such as computing the area contained within certain boundaries and helping to compile a list of all of the materials associated with certain kinds of projects.

Surprisingly, Energraphics has substantial capabilities for line drawings, too. As a drawing program, Energraphics is not as complete as Cadplan or as flexible, but it can be valuable to anyone who makes drawings to illustrate presentations.

While discussing Energraphics, I'd like to point out that this program has a capability that neither of the other two packages possesses. Energraphics can create impressive three-dimensional figures and surfaces. You have to plan ahead and often use trial and error to get the figure right, but the ability of the program to rotate, expand or shrink your work and to make changes based on new data is valuable.

This isn't meant to be a review of any of these programs. They each have specific strengths and weaknesses, but at least I now have some serious graphics programs to choose from to get some work done! The prices of these programs are



The Popcom modem supports 1200 bps and several automatic functions.

Contact the author at Box 691, Herndon, VA 22070.

not high, and a PC or similar system equipped with one can greatly reduce the workload of anyone who has groaned and sweated through the production of charts and drawings for important business presentations.

These programs are clear examples of the software now becoming available that surpasses the stage of doing little more than demonstrating the capabilities of the computer. They use the computer to honestly improve productivity. But remember, it took two full years of strong incentives to bring these programs into the market in mature form. Consider that when you invest your money in computer systems. Product maturity may be worth much more than flashy hardware.

Kaypro 88

In the February 1984 issue of *Microcomputing*, Thomas Howe did a good job of introducing you to the Kaypro 88. The publication of this excellent article forced me to find something else to write about in depth this month, but I do want to lend my support to the product. Kaypro portable microcomputers have always provided good value for the money, but the insertion of a 16-bit 8088 processor into the Kaypro to make it into the II-88 or 4-88 opens up more modern software for your use. You should clearly understand that the Kaypro 88 doesn't have a high degree of IBM compatibility, but it can use many programs created for the Microsoft disk operating system that do not depend on the unique PC graphics capabilities or special function keys. The Kaypro 88 system retains the excellent Kaypro screen and keyboard, but these simply are not the same as the PC's.

If you are looking for good quality and value, but don't need 100 percent IBM PC compatibility, the Kaypro 4-88 should be high on your list of systems to consider.

Modems Popping Out All Over

For those of you not familiar with the term, modems are devices that extend the communications capabilities of your microcomputer over telephone lines to reach subscriber information systems (such as BRS After Dark and CompuServe), public electronic bulletin board systems and other microcomputers across town or across the country.

In the mid 1970s, when microcomputers were just emerging, the most popular modem was the Novation Cat. This was a reasonably priced unit that connected to the telephone by cradling the handset in two rubber cups over a small speaker and microphone and exchanging tones with the handset.

The Cat was superseded in the popularity race by an innovative product from D.C. Hayes (now called Hayes Microcomputer Products) that doesn't just serve as a modem, but actually monitors the flow of data and watches for commands addressed to it. The Hayes Smartmodem automatically dials the telephone, answers a ringing telephone line and adjusts to different operating conditions. The Smartmodem is probably used in more microcomputer installations than any other modem. It's had a number of emulators and imitators, but Hayes has set the standard for commands and methods of connection. None of the emulators or imitators provided any really new capabilities . . . until now.

Now there is a new and unique challenger that offers even more operating features than the Hayes Smartmodem. Popcom, a new modem from an old company, Prentice Corp., does some nice things for you—particularly if you do a lot of direct microcomputer-to-microcomputer communications. Popcom also has a very nice price.

Physically, Popcom is designed to be heard but not seen. The compact gray box plugs directly into an ac power socket or power strip. Once you plug the cables from the computer and the telephone into the Popcom box, you never have to see it again. Popcom contains a small speaker that tells you when it has electrical power, computer connection and telephone connection by playing a short little "song." The series of musical tones tells you Popcom is ready. This simple indication replaces the flashing lights that are used as status indicators on almost all other modems. People have to be trained to interpret flashing lights, but they easily understand the meaning of a pleasant tune.

Popcom will perform all functions found in other contemporary modems with microprocessor controls, but it's smaller and lighter than almost all of the competition. Popcom does two things that really set it apart. Both of these functions allow you to combine voice and data communications during a single telephone call. If you are calling The Source, CompuServe or a local bulletin board, these functions won't be extremely valuable, but if you're exchanging information with someone in another office or another town, the ability to talk about what you're doing is useful.

I sometimes send my articles to publishers through a telephone modem. (Sorry to shock you, but very few of even the highest tech publishers accept material electronically on a regular basis . . . but that's a story for another column.) When pressed against a deadline, editors may get the office computer hacker to hook a modem up to some dusty machine sitting in a corner to try and capture the article. If you haven't done this before, discuss a lot of details before you begin the transmission. Agree on the speed, any error checking, the size of the file and other factors. You have to talk with words before you can talk with data.

If you use the old-style modems that work through the handset, you can talk and then turn the phone over to the modem to do its work. Modern modems are too refined to endure this kind of trivial talk between humans. The modern modem can be commanded to do its job when you are done talking, but this is an unusual action that requires searches through the manual and the muttering of strange incantations.

Usually, it's easier to hang up after the voice call and re-establish the connection using the automatic dial and automatic answer capabilities of the modems. This works well until some part of the transfer process breaks down, or the transfer is completed and you want to see what happened at the other end. You can pick up the phone attached to the modem, but chances are good that the modem on the other end will hang up at the sound of your "hello." So you redial and the cycle begins again.

Popcom does away with those problems. If two people are equipped with Popcom modems, they can begin their discussion by voice (Popcom automatically dials the call if you want to use your computer as an autodialer). When the discussion ends, they give a quick command to Popcom through the keyboard and exchange data.

If you want to interrupt the data call, you just lift the handset off the phone. Your Popcom immediately stops sending and the Popcom at the other end turns on its speaker. The person at the other end now hears your voice and picks up the phone to reply. You can switch between data and voice as many times as necessary to get the job done.

Popcom is the result of a great deal of research and planning. The large scale integrated circuit design reduces the price and size, eliminates the heat and increases the simplicity of the modem. Other modern modems have a series of internal switches that must be set to properly configure the modem to work with a particular software or computer. Popcom has internal programming that allows it to analyze the signals it is receiving and adapt.

Popcom's built-in programming also makes it easier to connect to multiline telephones. The manual describes the kind of jack you need to attach Popcom to the phone. The big advantage is that you can use the modem no matter what line the phone works with. You don't have to dedicate one line as the data line or bring in a separate expensive phone line for data as you have to with other modems.

Prentice's Popcom is going to be a significant challenger to the established leaders in the modem market. I recommend it to anyone contemplating a modem purchase.

The 1200-bits-per-second Popcom modem, with all of these automatic capabilities, has a retail price of $475.

For more information about Popcom,

contact Prentice Corp., 266 Caspian Drive, PO Box 3544, Sunnyvale, CA 94088.

Macintosh

I applaud Apple and its new Macintosh computer. Apple seems to have introduced this product as well as it is humanly possible to do. Their marketing and advertising approach has been mature but aggressive.

The big surprise from Apple isn't really the Macintosh system. The big surprise is the good strategy shown in producing lower-cost versions of Lisa that share Mac's capabilities. Apple suddenly has an integrated family of computers with a wide range of capabilities and prices. Their name and aggressive stance make this family appealing to anyone looking for an escape from the IBM PC and its "me too" followers.

For a while I thought Apple had really done something right by using the same Sony 3½-inch drives used by Hewlett-Packard. But then I found out that Apple used its own unique disk controller that makes the formatted disk unlike anything else in the world. The decision to use a unique disk format was a marketing mistake; they needed as much commonality in disk format as possible.

Apple has done a good job of trying to get third-party software ready for the Macintosh. We have Multiplan, 1-2-3 and other warmed-over PC products. But remember what I said at the beginning of this column. It will be a year or more before mature software is available to take advantage of the Mac's capabilities.

Buy Now?

The frequent question that people on the Washington cocktail circuit ask me is, "Should I buy a Macintosh?" (They ask other people much more interesting questions, but I'm known as that computer weirdo who isn't good for much else.) My consistent reply is, "No way, not yet." Mac is still too green.

I wouldn't buy a Macintosh for several months yet. First, the idea of a 68000 pushing around that puny amount of memory with no expansion capability is ridiculous. I know there's 64Kb of ROM in there holding graphics and other support functions, but 128Kb of RAM is just too puny. Wait until Apple replaces the present 64Kb RAM chips with 256Kb versions. When you get 512Kb of RAM and the operating system to use it, you'll have a strong practical machine.

I wouldn't buy a Mac yet because a modern microcomputer system without some kind of color capability is ridiculous. You can show me all of the detailed monochrome graphics you like, but when PCjr has color graphics, when Compaq puts a color graphics port in every machine, you have to have color graphics to compete. I don't have any inside information, but it certainly seems that a color version of the Macintosh must be on the way.

So my cocktail circuit advice is, "Wait before you buy a Macintosh." At least wait for more memory. Little Mac may be fun for now, but some evolution will turn the machine into a much better investment. Of course, everybody knows the value of advice you get at Washington cocktail parties. . . □

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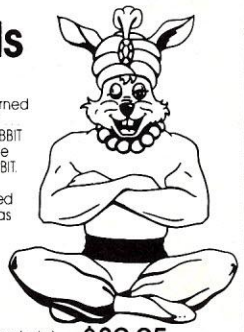
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The RABBIT is easy to install, allows one to Append Basic Programs, works with or without Expansion Memory, and provides two data file modes. The RABBIT is not only fast but reliable.

(The Rabbit for the VIC 20 contains an expansion connector so you can simultaneously use your memory board, etc.)



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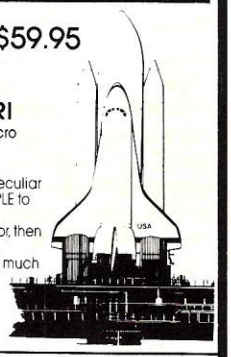
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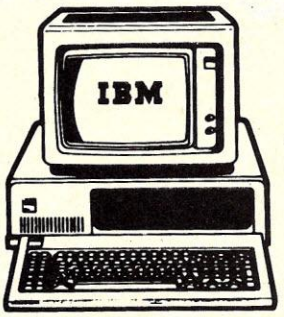
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By Robert W. Baker

Kilobytes And Kindergarten

Software for the Pre-School Set

Square Pairs

Looking for educational software for the VIC-20 and other Commodore systems?

You may want to look at Scholastic Wizware programs developed by computer specialists, experienced educators and communications experts. These programs are designed to allow children as young as five to use their imagination while they sharpen their learning skills.

Square Pairs, designed and developed by Teaching Tools Microcomputer Services, is currently distributed by Scholastic as part of the Wizware series. It was originally available on tape for the VIC-20 but required an 8Kb memory expansion. It's also available on tape or disk for the Commodore-64.

Square Pairs is a matching game something like Concentration. The computer displays a board with numbered boxes. At each turn you uncover two boxes, trying to find the boxes that match. One to four people can play the game against each other or against the computer. The player who finds the most matches wins the game.

When you start the program, it asks how many players there are and each of their names. You then choose one of the built-in games or one you've created. You may select the board size from three sizes: small has six boxes, medium has 12, and large has 18. While the program is building the game board, you can change the display colors, if desired.

Playing the game is simple and fully prompting. You enter the box numbers you'd like to select whenever it's your turn. The computer keeps track of the turns and the scoring. When a game is over, the winner is indicated.

It's easy to use the Square Pairs Gamemaker to create your own games. You can choose the game board size, the name of the game and the game matches to be used. Each game box holds three lines of text with up to seven characters in each line. When a game is created, the data can be saved on tape or disk, depending on the program version. These games can then be loaded and played with the Square Pairs program.

The VIC-20 version of Square Pairs includes four matching games: faces, sequences, cities and countries, and words and anagrams. However, the data repeats too quickly so you must create your own games to realize the full power of Square Pairs. The screen displays simple but effective color graphics with appropriate sound effects. All in all, a nicely done package.

For more information on Square Pairs and other Wizware offerings from Scholastic, write them at 730 Broadway, New York, NY 10003.

Executive-64

What a nice present! I was fortunate enough to receive an Executive-64 on loan from Commodore. At the time I received this system, only the single drive SX-64 was available. A later, double-drive system is planned and will be labeled the DX-64.

The Executive-64 model comes in a sleek-looking plastic case that measures 16×15 inches and 5½-inches high. The front panel detaches easily to become a moveable keyboard that's only about 1½-inches high (keys included). There's a protective rubber strip along the back edge of the keyboard to provide steady footing when in use. This strip blends in nicely with the overall design when the keyboard is attached.

A sturdy carrying handle folds down to provide a convenient stand raising the screen to an easy viewing angle. The handle is extremely rugged-looking, something you'd expect to find on expensive test equipment. A small zippered pouch attaches to the carrying handle, providing a handy place to store cables and other accessories and is large enough to hold two boxes of disks.

The single disk SX-64 also has an internal storage compartment where the second disk would be mounted in the DX-64. Commodore recommends not using this compartment for storing disks even though it's just the right size. They don't give any reason for the warning but it may be due to heat or magnetic fields around that area.

The internal disk drive is identical to the VIC-1541 and provides the same capabilities. A cardboard head vibration protector is provided to be inserted in the disk drive whenever the unit is transported. This will protect the recording heads from damage.

The built-in five-inch color monitor provides exceptional display quality, much better than anticipated. The 40-column screen is usable for most applications but a few letters may be hard to distinguish. The usual color, brightness, contrast and tint controls are accessible behind a door in the front panel, as is a

Address correspondence to Robert Baker, 15 Windsor Drive, Atco, NJ 08004.

volume control. You can still connect an external monitor like the Commodore 1702 via a rear-mounted eight-pin DIN connector for audio/video expansions.

Other rear-mounted connectors provide the two game ports, the serial bus connection for a printer or additional disks, ac power and the user port connector. The game ports are numbered with the #2 port nearest the right rear side and the #1 port towards the middle. The ac power cord is detachable and must be removed when transporting the system. Nothing is provided for wrapping the cord on the rear of the system.

Positioning of the user port connector may present a problem. Commodore's new 1650 Automodem cannot be plugged into the SX-64 since the power cord is in the way. Other peripherals that utilize the user port may not work if they are any wider than the user port itself. The only way they can be physically connected is by using some kind of bus extender.

The standard cassette tape interface found on the Commodore-64 is noticeably absent on the SX-64 system. In fact, you cannot reference the tape interface in programs run on the SX-64. Any attempt to use device #1, the tape, will result in an error message indicating an invalid device number.

Cartridges are inserted through a covered slot in the top of the unit. Two small covers protect the internal connector while not in use and flip down inside when a cartridge is inserted. Odd-shaped cartridges like the C-64 Link may catch on the covers, so use care when using nonCommodore cartridges in the SX-64.

The only disappointing feature is the way the keyboard is cabled to the main system. The keyboard cable attaches to an exposed connector along the rear edge of the keyboard. The other end attaches to a connector in a recessed opening in the bottom of the main system. When transporting the system, this cable should be removed and stored in the accessory pouch. The two connectors are then exposed during transporting with no protective coverings. Also, the keyboard cable is not a coiled cord and is only about 20 inches long.

All in all, the Executive-64 is an impressive system. Everyone I've shown the system to has commented on the packaging and style, as well as the quality of the color graphics and sound. You'll find the system fully compatible with the Commodore-64 and VIC-1541 disk drive. All C-64 software packages will run on the Executive-64 systems without any changes as long as they do not use cassette tapes.

1702 Monitor

The Commodore 1702 color monitor is an exceptional value. It's ideal for any Commodore-64 or VIC-20 owner who wants a top quality display at a reasonable price. A 14-inch color monitor with a built-in speaker for sound is enclosed in an attractive plastic case that matches the C-64.

The former model 1701 monitor came with a cable with a five-pin DIN connector for the earlier C-64 and VIC-20 systems. This connected the audio and video outputs from the computer to two RCA connectors on the front of the monitor. Additional connectors were available on the rear of the monitor, but the earlier computer systems did not provide the chroma signal on the audio/video DIN connector.

The current 1702 monitors are shipped with new cables that use an eight-pin DIN connector to connect the audio, chroma and luma signals to the three rear RCA connectors of the monitor. If you have one of the newer Commodore systems with an eight-pin audio/video DIN connector, simply plug in the cable and you're up and running.

If you have an older Commodore-64 system with the five-pin audio/video DIN connector, you cannot use the cable supplied with the monitor to connect your system directly to the monitor. The monitor manual shows how to connect the older two-jack cable from the computer to the front audio and video jacks on the monitor. This cable is not supplied with the monitor and must be purchased separately. In this case, the front monitor connectors are connected to the following DIN connector pins:

Audio	to	Pin 3 (Audio Out)
Video	to	Pin 4 (Video)

If you want to improve the video quality, you can buy an available five-pin DIN cable to connect the three rear monitor connectors to take advantage of the luma signal. The three rear monitor connectors should be connected to the following DIN connector pins:

Luma	to	Pin 1 (Luma)
Audio	to	Pin 3 (Audio Out)
Chroma	to	Pin 4 (Video)
Ground	to	Pin 2 (Ground)

This configuration is from a recent issue of *Commodore Microcomputer*.

Another alternative is to make a simple adapter for the eight-pin DIN cable supplied with the monitor. This requires an eight-pin female DIN socket, a five-pin DIN male plug and a little dexterity with a soldering iron. Four short wires between the two connectors are wired as shown in Table 1.

5-pin DIN Plug		8-pin DIN Socket
Pin 1 (Luma)	to	Pin 1 (Luma)
2 (Grnd)	to	2 (Grnd)
3 (Audio)	to	3 (Audio)
4 (Video)	to	6 (Chroma)

Table 1. Adapting the connectors.

This little adapter is really handy when you have several systems with both five- and eight-pin DIN connectors on them. It's quite simple to add or remove the adapter when switching from system to system. This also leaves the front audio and video jacks of the monitor free for connecting other video equipment.

Commodore News

Commodore recently signed an agreement with the Mark Williams Co. of Chicago, IL for Coherent, an advanced operating system for Commodore's next generation of computers based on the Zilog Z8000 microprocessor chip. Coherent is a multi-user, multitasking, modular operating system compatible with the AT&T Unix operating system. Combining the resources and ingenuity of both companies may make multi-user, multitasking computers truly affordable.

Unlike other operating systems, like MS DOS, PC DOS and CP/M, Coherent is multi-user and multitasking. Multi-user lets more than one user operate a single computer at the same time. Instead of having many individual computers, users can access one computer from several terminals, especially important to business and classroom settings. Multitasking lets the computer do more than one job at a time. The user can retrieve electronic mail, print a report and write on a word processor, simultaneously.

The Commodore version of Coherent will be "human engineered" so users with no computer experience can take the product out of the box and use it immediately. Coherent isn't an imitation of Unix. It actually corrects and enhances Unix capabilities.

Some of Coherent's features include:

- Application packages and teaching aids written for nonprogrammers.
- Compatibility with all Unix programs.
- Secure file system preventing data loss and file system breakdown, even in multi-user, multitasking environments.
- More compact and efficient design than Unix.
- Easy installation and use.
- Self-instruction course.
- Ability to run on floppy disk-based systems.
- Device independence.
- Programs that users can create, customize and connect without changing or modifying the individual software packages.

To generate the largest software library in the computer marketplace, Commodore has already contacted hundreds of the world's software vendors. In addition, Commodore will hold seminars to generate even more new business.

Commodore is presently negotiating with a number of firms for an integrated package including word processing, spreadsheet and graphics packages, and many other vertically integrated business applications.□

"Mac, Meet Microsoft"

Microsoft has taken the logical step of releasing its MS Basic for the Macintosh—the new heartthrob of the micro world. While this version doesn't completely exploit the Macintosh environment, it does let Mac run thousands of existing Basic programs virtually unchanged.

By Jim Heid
Microcomputing Technical Editor

Linguists say that a language dies if it doesn't evolve and grow. If that applies to programming languages too, Microsoft Basic is sure to live a long happy life.

Its latest version, for Apple's Macintosh, takes a logical step forward, reflecting the increased power and special features of the machine, while maintaining compatibility with earlier generations.

MS Basic for the Macintosh is different from past versions for two reasons. First, it's easier to use. Since it runs on the Macintosh, it uses the same pull-down menu and window- and mouse-oriented user interface as all Macintosh applications. If you can get around in the Macintosh environment, you can use MS Basic.

Second, it's more powerful. The language supports strings up to 32,767 characters long. All numeric variables are assumed to be double precision. Its decimal math package boasts 14-decimal precision. This increased power reflects the potent 68000 at the heart of Macintosh.

Let's see how the language looks first; then I'll look at what it can do.

Windows, Menus and No "OK"

You load MS Basic the same way you begin any Macintosh application: by double-clicking on its icon (see Fig. 1). In a few seconds, the screen in Fig. 2 appears.

The menu bar (the white bar across the top of the screen) contains the menu names. The Apple logo on the far left lets you access the standard Macintosh desk accessories—the scrapbook, alarm clock, note pad, calculator, key caps, control panel and the ever-popular puzzle.

The File menu (the next one to the right) lets you clear the resident program (New), load a program from disk (Open), save a program with a name (Save as...), save a program under its current name (Save) and leave Basic and return to the Macintosh Finder (Quit). All the options are virtually foolproof. For example, if you select the Open option before saving the program in memory, you get an alert box asking if you want to save the program before proceeding.

The next menu over, Edit, provides Cut, Paste and Copy options that you use when writing and editing programs. The final menu, Control, lets you stop a running program (like pressing Control-C), continue execution (like typing CONT), suspend execution (like Control-S), list a program (like typing LIST), run a program, and activate or deactivate the trace function (TRON and TROFF). If you prefer keyboard commands to pull-down menus, you can also type Command-C, CONT, Command-S, LIST, and TRON or TROFF, respectively.

There are three types of windows in Microsoft Basic: the command window, the output window and the list window (see Fig. 4). The command window is visible, or open, when a program is not running. The presence of the command window indicates that Basic is ready to accept commands—it's the equivalent of seeing the "OK" prompt. You type direct commands and new program lines and edit existing lines using the command window. You can move the command window around and change its size.

Address correspondence to Jim Heid, c/o Microcomputing, 80 Pine St., Peterborough, NH 03458.

The output window is where the results of your program are displayed. You can change the size of the output window using its size box, and you can change the width of lines displayed using Basic's Width command. Any typing and editing that you do in the command window also appears in the output window.

The list window is where you view the actual program lines. When Basic starts, no list window appears. You have to open one by either typing LIST or by selecting the List option from the Control menu. Once a list window is open, you can change its size using its size box, and you can scroll through it using the scroll bars (see Fig. 4). If you see a line that needs editing, you simply point to it and click the mouse button. The line appears in the command window, ready for editing. When you press return after editing the line, the list window is updated with the new line.

The best thing about the list window is that you can have more than one on the screen at once. Assume you've written a program with a subroutine that begins at line 1000. You need to edit line 420, but you'd like to see the subroutine while you do so.

With older versions of MS Basic, you'd have to type LIST 1000- (chances are the whole subroutine wouldn't fit on the screen at once), then edit line 420. On Macintosh, you can have one list window showing lines 1000 and up, and another list window showing the beginning of the program. Better still, you can scroll forward and backward through one list window while the other remains stationary. Fig. 3 illustrates this technique.

Let's sum up the differences in the way MS Basic looks on Macintosh. Instead of the "OK" prompt, a command window denotes Basic's command mode. The output window is where the results of your program are displayed. The list window is where you view your program. You can have more than one list window on the screen at once, showing different parts of your program, and you can scroll independently through each.

The 68000 Influence

The new MS Basic takes advantage of the Macintosh's very powerful 32-bit 68000 CPU. As mentioned earlier, all numeric variables are assumed to be double precision, instead of the single-precision type assumed by eight- and 16-bit versions of MS

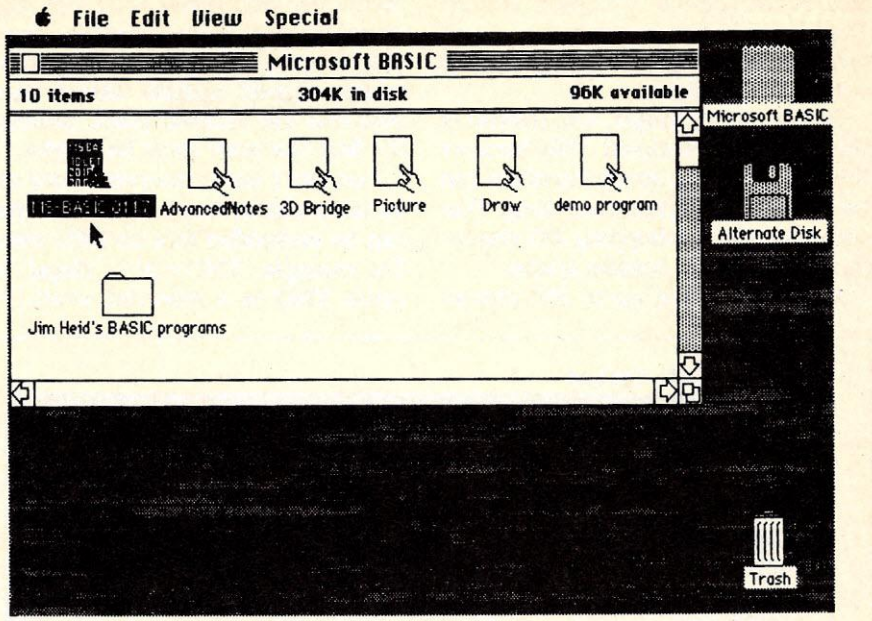


Fig. 1. The contents of the Microsoft Basic disk. Here, the MS Basic icon has been selected and is about to be opened.

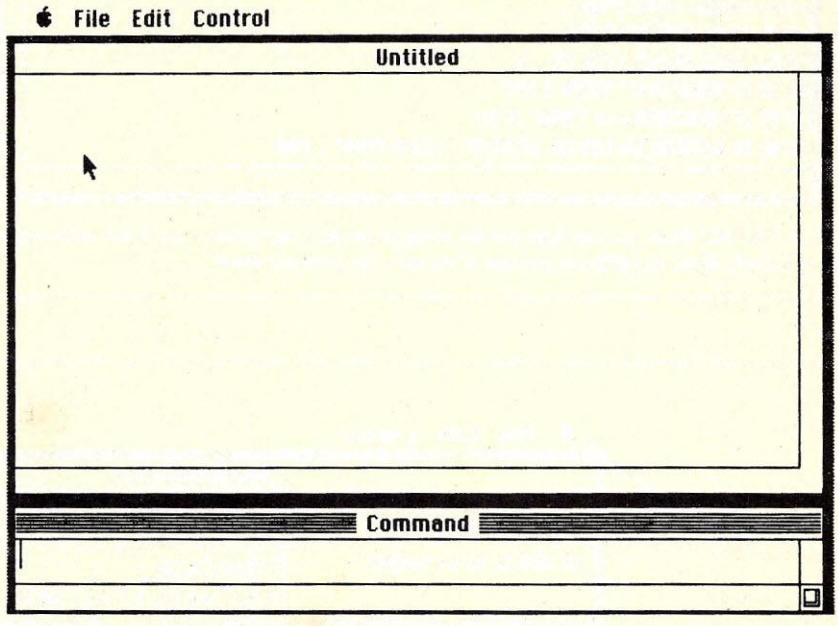


Fig. 2. The MS Basic opening screen. The output window is at the top of the screen; the command window is at the bottom.

```
10 REM      Routine to display a prompt within a circle
20 CLS
30 CALL MOVETO(200,200):                          REM ---  Bottom center of screen
40 CALL TEXTFACE(1):                              REM --- Change to boldface
50 PRINT "Next Page";:                            REM --- Print the prompt
60 CALL TEXTFACE(0):                              REM --- Return to plain text
70 CIRCLE(233,195),48,,,,.4:                      REM --- Draw the circle
80 IF MOUSE(0)<=0 THEN 80:                        REM --- If button not pressed, loop
90 IF MOUSE(1)<186 OR MOUSE(1)>266 THEN BEEP : GOTO 80:  REM --- not within circle
100 IF MOUSE(2)<180 OR MOUSE(2)>212 THEN BEEP : GOTO 80: REM --- same as above
110 CLS : PRINT "You've advanced to the next page." : END
```

Listing 1. A simple program that draws a circle, prints a prompt inside it, then waits for you to click the mouse in the circle. This method of selecting options can take the place of those old-style numbered menus.

Basic. Most MS Basic math functions also return double precision results. Double precision numbers are stored with 14 digits of precision and printed with up to 14 digits.

Strings can be longer, too. Instead of the more conventional 255-character limit, strings and string variables can be up to 32,767 characters long. Filenames can be a whopping 255 characters long and can contain spaces.

Arrays can have up to 255 dimensions, and the maximum number elements per dimension is 32,768. Both numeric and string variable names can be up to 40 characters long. Characters allowed include letters, numbers and the decimal point, although the first character must be a letter.

You can't use a reserved word as a variable name, but a reserved word can be embedded in a variable name. For example, END=30 is illegal, because END is a reserved word, but GENDER="BOY" is fine, even though the name GENDER contains the reserved word END.

MS Basic boasts device-independent input/output, meaning that you can direct input and output to or from the screen, keyboard, printer or Macintosh clipboard as if they were disk files. Using this feature, you can use one routine to direct output to the screen or printer, just by changing the device name in the Open statement.

The ability to access the Macintosh clipboard means that you can use Mac's cut-and-paste capabilities to transfer output from your Basic program to another Macintosh application. Your accounting program, for example, can send its output to the clipboard, where you can grab it later and put it in a report that you're writing with MacWrite.

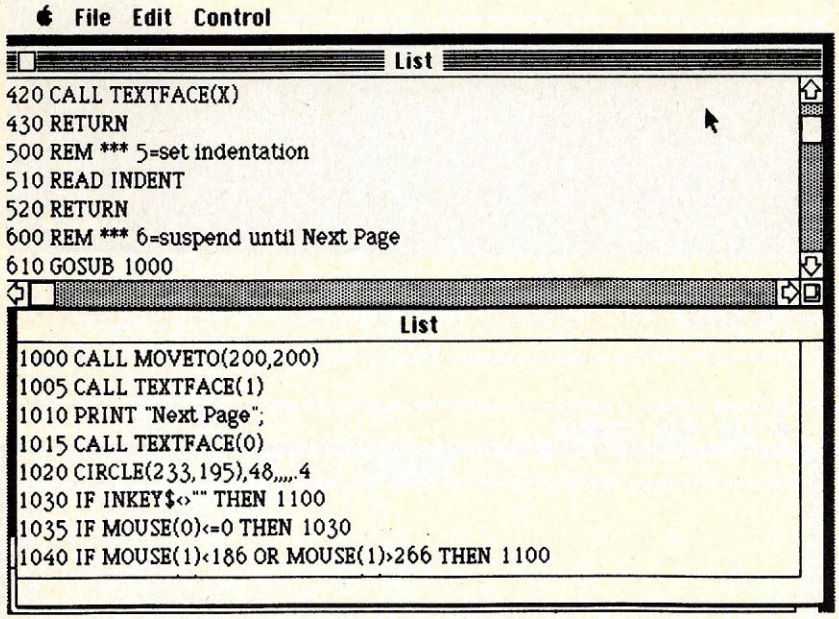


Fig. 3. With MS Basic, you can have two list windows on the screen at once and scroll independently through each. Here, two different portions of the same program are shown.

Making a Statement

The new MS Basic has a host of statements that support Macintosh graphics. The Line statement lets you draw a line between two points and has options that let you draw a hollow or filled box. The Circle statement lets you draw hollow and filled circles or ellipses, according to the center point, radius and number of radians you specify.

The Get and Put statements used in disk file access also have graphics applications. Get saves a screen area that

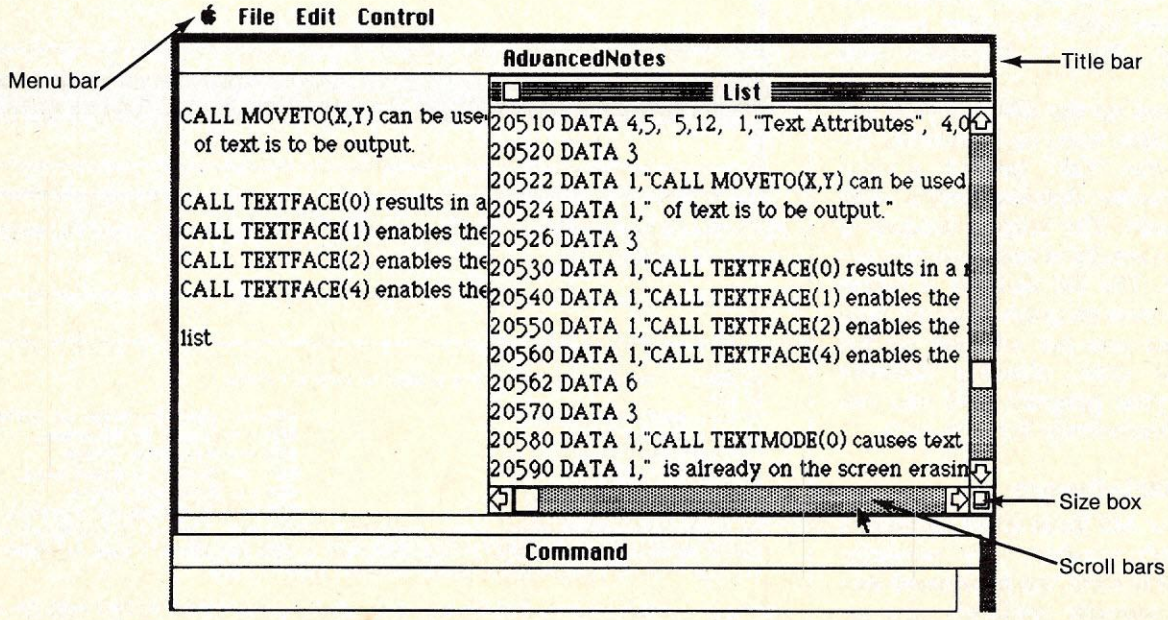


Fig. 4. An MS Basic screen and its components

ABS	DEFDBL	FRAMERECT
ALL	DEFINT	FRAMEROUNDRECT
AND	DEFSNG	FRE
APPEND	DEFSTR	GET
AS	DELETE	GETPEN
ASC	DIM	GOSUB
ATN	EDIT	GOTO
AUTO	ELSE	HEX$
BACKPAT	END	HIDECURSOR
BASE	EOF	HIDEPEN
BEEP	EQV	IF
CALL	ERASE	IMP
CDBL	ERASEARC	INITCURSOR
CHAIN	ERASEOVAL	INKEY$
CHR$	ERASERECT	INPUT
CINT	ERASEROUNDRECT	INSTR
CIRCLE	ERL	INT
CLEAR	ERR	INVERTARC
CLOSE	ERROR	INVERTOVAL
CLS	EXP	INVERTRECT
COMMON	FIELD	INVERTROUNDRECT
CONT	FILES	KILL
COS	FILLARC	LEFT$
CSNG	FILLOVAL	LEN
CVD	FILLRECT	LET
CVI	FILLROUNDRECT	LINE
CVS	FIX	LINETO
DATA	FN	LIST
DATE$	FOR	LLIST
DEF	FRAMEARC	LOAD
	FRAMEOVAL	

Table 1. The reserved words used in Microsoft Basic on the Macintosh. If you attempt to use these words as variable names, a syntax error is generated. The longer words aren't commands but Toolbox routines.

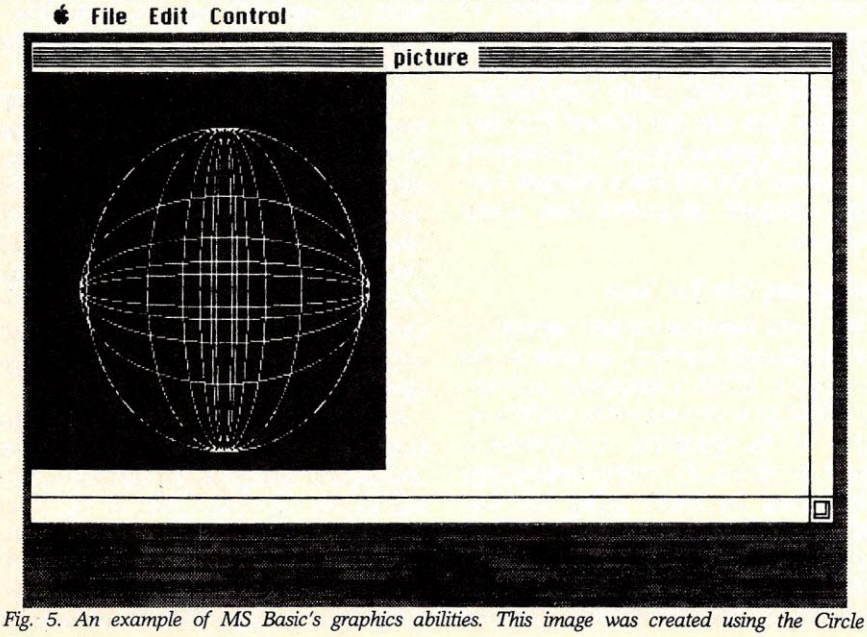


Fig. 5. An example of MS Basic's graphics abilities. This image was created using the Circle statement.

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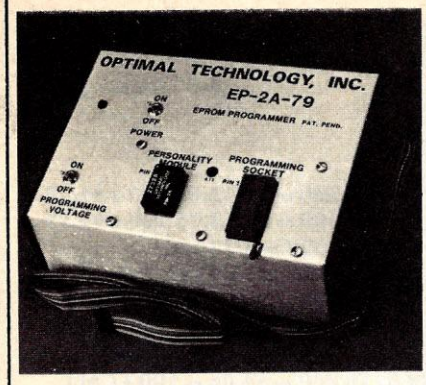
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you specify in an array, letting you store a picture of a graphic image in memory. The Put statement redisplays the image. Special options for Put let you draw a reverse image (black on white) and superimpose a moving image over a background without erasing the background, useful when you want animation. The PSet and Preset statements let you light a single point on the Macintosh's 512 by 342 pixel screen, and the Point statement lets you determine if a given point is lit.

To get a printout of all the slick graphics you draw, use the LCopy statement. It sends an exact image of the screen to your Imagewriter printer.

The remaining MS Basic statements are very similar to their counterparts from earlier versions. A full list of MS Basic statements and reserved words is shown in Table 1.

A Better Mousetrap

A Macintosh programming language wouldn't be complete if it didn't support the machine's mouse. MS Basic has a function called Mouse, which returns the coordinates of the mouse pointer under five conditions: button up, button down, single click, double click and drag.

You can use the Mouse function to write programs that respond to the mouse. The program in Listing 1 draws a circle on the screen and waits until you position the mouse pointer within the circle and click the button before continuing. You can use the same technique in your programs.

Instead of an old-fashioned menu with numbered options, your program could display a number of circles, each with an option name inside it. You could then select options by simply clicking inside their circles. You can also use the Mouse function to write programs that let you draw on the screen. The MS Basic manual contains example programs that show you how.

Unlocking the Toolbox

MS Basic features limited support of the Macintosh Toolbox, an area of the machine's ROM containing subroutines that give you access to certain aspects of its operating environment. You can access 41 machine-language subroutines by name using the Call statement. The command Call Textfact(1), for example, causes text to be printed in boldface; Call Textface(3) switches to underlined text. Subroutines are available that draw rectangles and ovals, change the typeface and size, move to a certain point on the screen, show and hide the cursor and more.

Documentation

The MS Basic manual is 215 pages long, spiral bound and divided into two main sections. The first half explains the various menus and window types and describes the language's special features; the second half is a reference section that lists each function and statement, describes its syntax and purpose and provides an example program illustrating its use. The manual is well-written, but the reference section is strictly for reference; it won't teach you how to program.

The manual contains an appendix that lists the 41 Toolbox routines supported by the language, but it doesn't tell you what each routine does and how to use it. You need a copy of Apple's *QuickDraw Programmer's Guide* for that information. A short program called Advanced Notes is included on the MS Basic disk that does document a few of the typestyle-related ROM routines, however.

Another appendix explains how to transfer data from a Multiplan worksheet to a Basic program, and vice-versa, using the clipboard.

Closing REMs

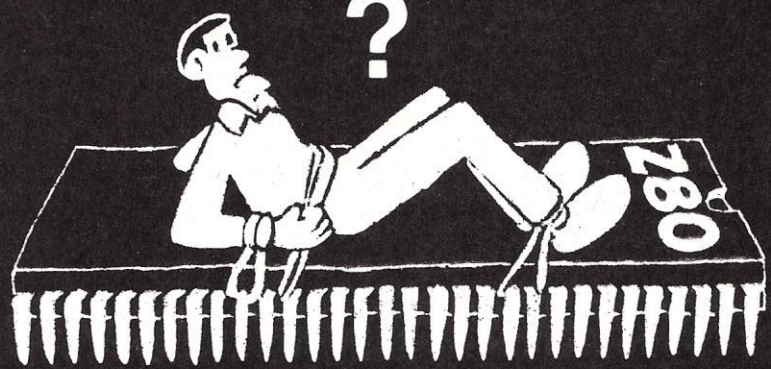
MS Basic does not completely exploit the Macintosh environment. It doesn't let you create your own pull-down menus and multiple windows, nor does it support the majority of the Macintosh Toolbox routines. You'll have to wait for Apple's own MacBasic for that (it should be available by summer).

MS Basic is, however, a logical step forward for Microsoft Basic. It's one of the easiest versions of Basic to use, thanks to its pull-down menus and multiple windows. It supports the Macintosh's mouse, graphics and some Toolbox subroutines. It exploits the power of the Macintosh's 68000 CPU by providing math functions with 14-digits of precision and strings up to 32,767 characters long.

Its device-independent input/output features let you route program input and output and give you access to the Macintosh clipboard. Best of all, it retains compatibility with previous generations of Microsoft Basic, which means that thousands of existing Basic programs can run virtually unchanged on the Macintosh.■

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Covering All the Bases

Bases are invaluable for quick-and-easy programming, but even veterans are plagued by rusty conversion skills. This utility program is designed to convert those bases and get you up and running.

By Henry Gernhardt

One of the major educational hurdles for budding programmers is the understanding of bases. The programmer doesn't necessarily have to be able to work in bases other than 10, but sometimes knowledge of base 2 or base 16 can tremendously shorten your programming effort (see sidebar).

To the novice, base 2 (binary) is perhaps the easiest to learn. Once you have a thorough understanding of place value in base 10, you should find it easy to use other bases as well. But because bases other than 10 are so seldom used, the skills get rather rusty. Sometimes a utility program can be the most helpful. Base 16 is quite useful when working in assembly language, and base 2 is useful when setting or reading bits using Poke or Peek (e.g., setting up port routines, and so on.).

A Base Hit

BINAHEX, although intended for use with bases 2 through 16, should work in any base up to base 36. Only bases 2–16 have been tested. The program provides three different menu-selected modules. The conversion module converts to or from any base; the math module allows two-number addition, subtraction, multiplication or division. Fractions are not allowed, so division rounds to the nearest whole number. Negative numbers can be used.

The test module will be useful to those brushing up on their conversion skills in the specified base. Base-to-base conversions are not provided for, though such a module could easily be added, with the expense of a higher memory requirement. Base to decimal or decimal to base are considered the most useful for students.

The testing routine supplies ten random numbers in the specified base or base 10. The random number ceiling is user-selectable up to 32,000 base 10. You must supply the appropriate base 10 or specified base answer. The program shows you the number correct out of ten and give a percentage score. No recording of this data is allowed for, but a simple LPrint will output to a printer.

Although designed to work in the TRS-80 Model III, BINAHEX should work in most any computer with a Microsoft Basic. I have tried to keep all commands general enough, at the expense of some memory, in order to implement this portability. If you have another brand of computer, feel free to enter this program. The only changes that are necessary occur where screen formatting commands such as Print Tab are used, and in line 380 (which may be deleted) where pokes are used to empty the Inkey buffer, which prevents impatient key punchers from missing the next screen.

Notice that most Gotos and Gosubs branch to a remark. This fulfills two purposes. When writing and debugging, the REMs are invaluable for quick reference points. Once your program is debugged, leave the remarks in if you have enough memory; they're helpful if you need future modifications.

You should recall the method of converting numbers in a given base to base 10. Given any number (say ABCD), the rightmost numeral is in the ones (or base to the power 0), the next numeral (in this case "C") is in the base to the first position, the "B" is in the base to the second and the "A" in the base to the third. Thus, 3421 in base 5 equals, right to left, (1*5↑0)+(2*5↑1)+(4*5↑2)+(3*5↑3), or 486 in base 10.

The loop formed by lines 1680–1710 processes the number in the chosen base as a string; the string is in turn processed as an array. Each place value is stripped from the right end of the array and multiplied by the appropriate place value of the chosen base. The result is then added to a running sum and converted back into a string (B$).

The method for converting from base 10 to a given base is to divide the base 10 number by the given base and cast out the remainder to the next rightmost position of the resultant. The integer quotient of each succeeding division and casting out process is again divided by the given base; the remainder is then cast out again. Once the quotient is zero, the conversion is complete. Any remainder that is ten or greater in the casting out process is converted to a letter by making the assumption that A=10, B=11 and so on.

Strings are again used in the base-10-to-given-base module, lines 1740–

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1820, by continually concatenating the ASCII equivalent of the cast out numbers to the front of the resulting number in the chosen base.

Beware

Limits and warnings are indicated in the program itself, but an understanding of their reasons may be helpful if you wish to modify the program. Because of rounding errors introduced when the Model III automatically goes into double precision math, the accuracy limits of this program have a ceiling of about ±65,535 in base 10 or that equivalent in another base. The strict use of integer math would have resulted in a maximum ceiling of about 32,000 base 10. This upper limit of 65,535 will also hold true in resultants from the math module. Unless your computer approaches mathematical processes differently, as do some scientifically oriented computers and programmable calculators, these limits should be strictly observed when using BINAHEX.

The program can also work in bases above 36, but who needs it? The self-imposed limit is due to several non-alphabetic symbols being located between the upper- and lowercases of the Model III ASCII chart. Therefore, base input is limited to 36 (which uses the entire alphabet through "Z"). The opening screen statement of bases 2–16 is because, as mentioned previously, no testing has been done to any great extent above base 16. The program does not allow entry of bases other than 2–36.

The use of the program is straightforward and menu-oriented. One important thing to remember is that anytime a number of any base is called for, except in the test mode, entering an "@" anywhere in the number will send you back to the menu.■

Listing 1. BINAHEX

```
10 REM VARIABLE LIST
20 REM NA$=NAME OF PERSON USING THE PROGRAM
30 REM D$=DIRECTION OF CONVERSION - TO OR FROM BASE 10
40 REM N$=NUMBER ON WHICH WORK IS OCCURRING - TESTING OR
   CONVERSION
50 REM S$= HOLDER FOR SIGN
60 REM B$=CONVERTED NUMBER
70 REM B= BASE TO USE
80 REM MC= MENU CHOICE
90 REM IN= INTERMEDIATE NUMBER IN BASE CONVERSIONS
100 REM NR= NUMBER RIGHT ON TEST
110 REM F= FLAG OF ILEGAL NUMBER IN THE BASE
120 CLEAR 100
130 CLS:PRINT CHR$(23)
140 FOR I= 2 TO 60 STEP 2
150 PRINT @I,"*";@I+960,"*";
160 NEXT I
170 FOR I=64 TO 896 STEP 64
180 PRINT @I,"*";@I+62,"*";
190 NEXT I
200 PRINT @142,"- - BINAHEX - -";
210 PRINT @ 284, "by";
220 PRINT @394,"HENRY C. GERNHARDT JR";
230 PRINT @528,"926 9th Street";
240 PRINT @658,"Huntington, WV";
250 PRINT @794,"25701";
260 FOR I= 1 TO 1000: NEXT I
270 CLS
280 PRINT :PRINT:PRINT
290 PRINT TAB(13)"BINAHEX CONVERTS INTEGERS TO AND FROM"
300 PRINT TAB(13)"BASE  TEN.  IT PERFORMS THE 4  MATH"
310 PRINT TAB(13)"FUNCTIONS IN BASE 2-16 AND ALLOWS FOR"
320 PRINT TAB(13)"TESTING OF THE STUDENT'S BASE CONVER-"
330 PRINT TAB(13)"SION ABILITIES."
340 PRINT:PRINT TAB(15)"ENTERING <@> IN/WITH ANY NUMBER"
350 PRINT TAB(15)"WILL RETURN YOU TO THE MENU.":PRINT:PRINT
   TAB(11)"ACCURACY LIMITS= +-65535 (+-FFFF base 16)."
360 PRINT @914,"PRESS <ENTER> TO CONTINUE";
370 REM THE FOLLOWING POKES PREVENT PREMATURE REGISTERING
   OF THE ENTER KEY
380 POKE 16537,0:POKE 16538,0
390 A$=INKEY$
400 IF A$<>CHR$(13) THEN GOTO 390
410 CLS
420 PRINT CHR$(23)
430 PRINT @206,"WHAT IS YOUR NAME";
440 PRINT @404,"";
450 INPUT NA$
460 REM GET BASE AND ORDER - TO OR FROM BASE 10
470 CLS
480 PRINT CHR$(23)
490 PRINT @198,"WHAT BASE, "NA$;:INPUT B
500 IF B<2 OR B>36 THEN PRINT @326,"VALID BASES= 2 TO 36";:FOR
   I= 1 TO 1000:NEXT I: GOTO 470
510 PRINT @326,"<T>O OR <F>ROM base 10";
520 PRINT @470,"(T/F)";:INPUT D$
530 IF D$<>"T" AND D$<>"F" THEN CLS: PRINT CHR$(23):GOTO 510
540 REM BUILD MENU
550 CLS
```

More

Here is an example of the direct relationship between binary and hexadecimal numbering systems and, by interpolation, the reason why hex is used by most software monitors and assembly languages.

Let's use the eight-bit binary number 10111111, which is equal to 191 in base 10. Count off four places from the right and divide the number into two four-bit groups (thus: 1011 / 1111) and pretend that each group is a separate four place binary number.

1011_2 equals 11 in base 10. 1111_2 equals 15 in base 10. Notice that 11_{10} equals "B" in base 16 and 15_{10} equals "F" in base 16. Simply concatenate the B and F to get BF_{16}. Does BF_{16} equal 191 also? It does!

Another example:

10001011_2	$= 139_{10}$
1000 / 1011	
8 / 11	in base 10
8 / B	in base 16

Therefore $10001011_2 = 8B_{16} = 139_{10}$

This allows an easy way to set bits for whatever purpose described in your operations manual. If your manual states that certain bits must be set or not set to configure, for example, an RS-232C port, start with eight zeros (eight off bits), place a 1 at the locations you wish to set, and convert the complete resultant eight-bit number to either decimal (for use in Pokes) or hexadecimal (assembly). Conversely, to find out if a certain bit is set or not set, Peek the appropriate location or use your software monitor or Debug (Model III TRS DOS), convert the number to eight-bit binary, and read the bits.

So why use hexadecimal? A page full of 1s and 0s would soon drive even the most picayune among us to tears and the amount of paper used for a simple program would rival that used by a government agency in a day!□

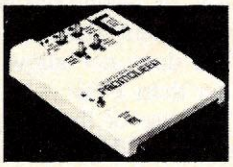
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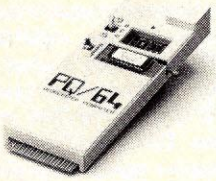
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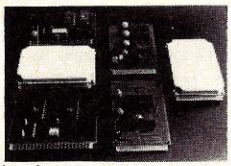
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Listing continued.

```
560 PRINT CHR$(23)
570 PRINT @146,"1 - BASE CONVERSIONS";
580 PRINT @274,"2 - PERFORM MATH";
590 PRINT @402,"3 - TEST";
600 PRINT @530,"4 - CHANGE BASE/ORDER";
610 PRINT @658,"5 - END PROGRAM";
620 PRINT @782,"YOUR CHOICE, "NA$;
630 INPUT MC
640 IF (MC<1)OR (MC>5) THEN GOTO 540
650 ON MC GOTO  660 , 810 , 1120 ,460 ,1830
660 REM BASE CONVERSIONS
670 CLS:PRINT@844,"VALID ACCURACY IS +/- 65535 base 10."
680 PRINT@17,"ENTER "CHR$(34)"NUMBER"CHR$(34);:INPUT N$
690 IF D$="T" THEN GOSUB 1500 :IF F= 1 THEN GOTO 660
700 IF D$="T" THEN GOSUB 1640
710 IF D$="F" THEN TB=B:B=10:  GOSUB 1500 : B=TB:IF F= 1 THEN
    GOTO 660
720 IF D$="F" THEN GOSUB 1740
730 IF D$="T" THEN PRINT @337,N$"    base"B"="B$"    base 10"
740 IF D$="F" THEN PRINT @337,N$"    base 10 = "B$"    base"B
750 A$=""
760 PRINT @900,"PRESS <@> TO RETURN TO THE MENU, <A>
    FOR ANOTHER "CHR$(34)"NUMBER"CHR$(34)
770 A$=INKEY$
780 IF A$="A" THEN GOTO 660
790 IF A$="@" THEN GOTO 540
800 GOTO 770
810 REM PERFORM FUNCTIONS
820 CLS
830 PRINT @910,"ENTER <@> TO RETURN TO THE MENU"
840 PRINT @844,"VALID ACCURACY IS +/- 65535 base 10.":PRINT @0,
    "ENTER FIRST "CHR$(34)"NUMBER"CHR$(34);:PRINT STRING$
    (10," ");:PRINT @20,"";:INPUT B1$:N$=B1$
850 IF D$="F" THEN TB=B: B=10
860 GOSUB 1500 : IF D$="F" THEN B=TB
870 IF F=1 THEN PRINT @386, STRING$(50," ");:GOTO 840
880 PRINT @64,"ENTER FUNCTION (+,-,*,/)";:PRINT STRING$
    (10," ");:PRINT @88,"";
890 F$=""
900 INPUT F$
910 IF (F$<>"+") AND (F$<>"-") AND (F$<>"*") AND (F$<>"/") THEN
    GOTO 880
920 PRINT @128, "ENTER SECOND "CHR$(34)"NUMBER"CHR$(34);:PRINT
    STRING$(10," ");:PRINT @149,"";:INPUT B2$:N$=B2$
930 IF D$="F" THEN TB=B: B=10
940 GOSUB 1500 :IF D$="F" THEN B=TB
950 IF F=1 THEN PRINT @386,STRING$(50," ");:GOTO 920
960 N$=B1$:IF D$="T" THEN GOSUB 1640 :N1=VAL(B$)
970 IF D$="F" THEN GOSUB 1740 : B1$=B$: N1=VAL(N$)
980 N$=B2$: IF D$="T" THEN GOSUB 1640 :N2=VAL(B$)
990 IF D$="F" THEN GOSUB 1740 :B2$=B$:N2=VAL(N$)
1000 CLS
1010 PRINT TAB(30)"base"B"NUMBER" TAB(49)"base 10 NUMBER"
1020 PRINT TAB(43-LEN(B1$));B1$;TAB(62-LEN(STR$(N1)));N1
1030 PRINT TAB(43-LEN(B2$)-2); F$;TAB(43-LEN(B2$)); B2$; TAB
     (62-LEN(STR$(N2))-2); F$;TAB(62-LEN(STR$(N2)));N2
1040 PRINT TAB(43-LEN(B2$)-2);STRING$((LEN(B2$)+2),"-"); TAB
     (62-LEN(STR$(N2))-2);STRING$(LEN(STR$(N2))+2,"-")
1050 GOSUB 1420
1060 N$=STR$(NA)
1070 GOSUB 1740
1080 PRINT TAB(43-LEN(B$));B$ TAB(62-LEN(STR$(NA)));NA
1090 PRINT @900,"PRESS <@> TO RETURN TO THE MENU, <A>
     FOR ANOTHER PROBLEM."
1100 A$="": IF F$="/" THEN PRINT @654,"QUOTIENT ROUNDED TO
     NEAREST WHOLE #";
1110 A$=INKEY$:IF A$="@" THEN GOTO 540  ELSE IF A$="A" THEN GOTO
     810 ELSE GOTO 1110
1120 REM TEST MODULE
1130 NR=0
1140 CLS:PRINT TAB(11)"THIS TEST WILL CHOOSE A RANDOM NUMBER "
1150 PRINT TAB(11)"UP TO 32,000 BASE 10."
1160 PRINT TAB(11)"ENTER THE HIGHEST NUMBER WITH WHICH"
1170 PRINT TAB(11)"YOU WISH TO WORK (1 - 32000)";
1180 INPUT R:IF R=0 OR R<-32000 OR R>32000 THEN GOTO 1140
1190 FOR I= 1 TO 10
1200 CLS
1210 PRINT @50,"QUESTION"I
```

More

Listing continued.

```
1220 N$=STR$(RND(R))
1230 GOSUB 1740
1240 N1=.5
1250 IF D$="T" THEN PRINT"WHAT IS THE base 10 NUMBER
     FOR:":PRINT:PRINT TAB(18)B$"   base"B;: INPUT N1$
1260 B1$=""
1270 IF D$="F" THEN PRINT "WHAT IS THE base"B" NUMBER
     FOR: " :PRINT:PRINT TAB(18)N$"   base 10";:INPUT B1$
1280 IF VAL(N1$)=VAL(N$) OR B1$=B$ THEN PRINT @594,"VERY
     GOOD, " NA$:NR=NR+1 ELSE PRINT@594, "SORRY, "NA$:
     PRINT @657, N$    "   base 10 EQUALS":PRINT@722, B$"
     base"B
1290 PRINT @914,"PRESS ANY KEY TO CONTINUE";
1300 IF INKEY$="" THEN 1300
1310 NEXT I
1320 REM REPORT RESULTS
1330 CLS
1340 PRINT CHR$(23)
1350 PRINT @ 208,NA$", YOU GOT";
1360 PRINT@462,"*** "STR$(NR)" ***  RIGHT";
1370 IF NR>0 THEN PRINT @598,INT((NR/10) *100)"%"; ELSE PRINT
     @598,0"%";
1380 PRINT @902,"PRESS <@> TO RETURN TO MENU";
1390 A$=""
1400 A$=INKEY$:IF A$="@" THEN GOTO 540  ELSE GOTO 1400
1410 REM SUBROUTINES BEGIN HERE
1420 REM PERFORM ACTUAL MATH
1430 IF (F$="+") THEN NA=N1+N2
1440 IF (F$="-") THEN NA=N1-N2
1450 IF (F$="*") THEN NA=N1*N2
1460 IF (F$="/") AND (N2<>0) THEN NA=FIX(N1/N2+.5)
1470 IF NA<0 THEN NA=NA-1
1480 IF (F$="/") AND (N2=0) THEN PRINT "YOU CAN'T DIVIDE BY
     ZERO":NA=0
1490 RETURN
1500 REM SUBROUTINE TO TEST FOR LEGAL NO.
1510 S$="":F=0
1520 IF LEFT$(N$,1)="-" THEN S$="-":N$=RIGHT$(N$,LEN(N$)-1)
1530 FOR I= 1 TO LEN(N$)
1540 IF MID$(N$,I,1)="@" THEN GOTO 550  ELSE IF MID$(N$,I,1)="."
     THEN GOTO 1590
1550 TN=VAL(MID$(N$,I,1))
1560 IF TN=0 AND MID$(N$,I,1)>="A" AND MID$(N$,I,1)<="Z" THEN
     TN=ASC(MID$(N$,I,1))-55
1570 IF TN=0 AND (MID$(N$,I,1)<>"0") AND (MID$(N$,I,1)<"A" OR
     MID$(N$,I,1)>"Z")THEN GOTO 1590
1580 IF TN<B THEN 1610
1590 PRINT @386,S$+N$" IS NOT ACCEPTABLE IN base"B:F=1
1600 FOR K=1 TO 1000:NEXT K:RETURN
1610 NEXT I
1620 N$=S$+N$
1630 RETURN
1640 REM SUBROUTINE TO CONVERT TO BASE  10
1650 S$=""
1660 IF LEFT$(N$,1)="-" THEN S$="-":N$=RIGHT$(N$,LEN(N$)-1)
1670 L1=LEN(N$): B$="0"
1680 FOR I= 0 TO L1-1
1690 IF ASC(MID$(N$,L1-I,1))>=65 THEN B$= STR$
     (((ASC(MID$(N$,L1-I,1))-55)*B[I)+VAL(B$)):GOTO 1710
1700 B$=STR$((VAL(MID$(N$,L1-I,1))*B[I)+VAL(B$))
1710 NEXT I
1720 N$=S$+N$:B$=S$+STR$(INT(VAL(B$)+.5))
1730 RETURN
1740 REM SUBROUTINE TO CONVERT FROM BASE 10
1750 S$=""
1760 IF LEFT$(N$,1)="-" THEN S$="-":N$=STR$(ABS(VAL(N$)))
1770 WN=VAL(N$):B$=""
1780 IN=WN-(INT(WN/B)*B)
1790 IF IN>9 THEN B$=CHR$(IN+55)+B$ ELSE B$=CHR$(IN+48)+B$
1800 WN=(INT(WN/B))
1810 IF WN=0 THEN N$=S$+N$:B$=S$+B$:RETURN ELSE GOTO 1780
1820 NEXT I
1830 REM END OF PROGRAM
1840 CLS:PRINT CHR$(23)
1850 PRINT @336,"HAVE A NICE DAY";
1860 PRINT @470,NA$
1870 FOR I=1 TO 1000:NEXT I:CLS:END
```


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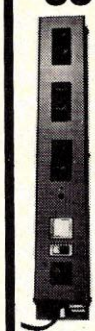
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Ready, Set . . .

Understanding set theory will make the task of establishing the logical relationship among parts of data in your programs easier. In this article, the author details what sets and subsets have to offer you in terms of program design.

By Michael Conwell

Microcomputing readers come from a variety of backgrounds and have a wide range of experience in the field of computer programming. Regardless of individual levels of knowledge, there's one thing everyone has in common when it comes to interpreting a problem for computer solution: you have to design a program before it can be coded into any computer language.

The task of designing programs can be time-consuming, difficult (in some instances) and, without question, intrinsically rewarding when the task is completed. In this article, I'll present a tool for establishing (in a symbolic way) the logical relationships among parts of the data in your program, which will in turn provide a visual understanding of the logic of the relationship. The tool is set theory.

Know What You're Doing

The first task in designing a program is to understand what you're being asked to do. As an example, consider the task of producing a list of employees who have worked for a company for at least 15 years and are 40 years of age or older.

Say that the list is necessary to forecast retirement pay for a period x years in the future and that such forecasts demand knowledge of the number of employees reaching a certain level of work history (15 years in this example), along with a minimum age (40 in this example).

Since there are more employees than you can process by hand, a computerized record-keeping system with an employee file exists for the company. From that file, you'll be able to produce the needed list.

Before you begin to think about Read statements or Print commands, you must have a clear understanding of the problem you're dealing with and know how to manipulate the data to produce the final list.

In this simplified example, you'll be producing a list of employees who satisfy certain criteria with respect to their ages and the years they've worked for the company. The list should not include any employees except those who satisfy both criteria. Once you understand the general nature of the problem, you can begin to refine its statement so that it will approach a form from which we can do the final design.

Sets, Subsets, Etc.

Some elementary knowledge of set theory is useful in evaluating and refining a problem—and even in visualizing the most efficient manner needed to sort the desired data elements for your final list.

You have probably already been exposed to the terms "set," "subset," "intersection," "union" and "complement." These terms, used in the discussion of set theory, have fairly simple meanings.

A set is the collection of elements or data items, such as a file or group of associated files, you are working with. In my example, the set is the employee file.

A subset is any portion of the set of employees. Two or more sets of subsets (set and subset are interchanged regularly—the term "universal set" is often used to designate the full set of data from which all other sets or subsets are drawn) can be combined by specific operations to create new sets and subsets. When two sets are combined by the union operation, it means that the elements of one set are joined with the elements of the other set to form a new one.

If you have a set of female employees and a set of part-time employees, the union of those two sets creates one that has as its elements people who are either female or part-time. While there may be some members of the new set who are both female and part-time, their presence is not due to their having both of these characteristics, but rather to the fact that they have at least one of them.

An intersection of two sets or subsets creates a new set—one that's different from that formed by a union. The intersection of the two example sets produces a set made up of persons having both characteristics.

One way to visually represent the difference between a union and an intersection is with Venn diagrams. In Fig. 1, the rectangle represents the full set of employees (the universal set), and the two circles represent the subsets of female employees (F) and part-time workers (P).

The area of overlap in Fig. 1 contains those employees who have both characteristics F and P. The Venn diagram can help to visualize the relationships between the elements within the sets or subsets in question.

To use this diagram to represent the concept of union and intersection, shade the appropriate areas for each. The shading in Fig. 2 shows the concept of intersection.

The cross-hatched area represents the intersection of F and P, the area where characteristics F and P overlap. The only elements that can exist

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within this area are those having both characteristics. That portion of F which is not cross-hatched consists of female employees who do not work part-time, and that portion of P which is outside the cross-hatched area consists of employees who are part-time but not female.

Contrast Fig. 2 with Fig. 3, which shows the concept of a union. The entire surface of F and P is cross-hatched, bringing the elements of one together with the elements of the other. With respect to characteristics, having F is sufficient, having P is sufficient and having both is sufficient but not necessary.

In the language of set representation and Venn diagrams, the intersection of F and P is stated as F^P (read "F intersect P"), and the union of F and P is written F∨P (read "F union P"). If there are three subsets of your employee file (in other words, if you're looking for three characteristics to determine placement on the list), you'll have a Venn diagram, as in Fig. 4, where there are assumed to be multiple areas of overlap of the three characteristics.

If you want to identify persons on the basis of not only sex (F) and part-time status (P) but also job category (C), then three subsets come into play. If you're concerned with the subset involving characteristics F, P and C, then that small portion in the middle where the three intersect graphically describes that subset. The set representation of that subset is F^P^C.

To Operate . . .

To operate on sets and subsets with only the intersection operation or only the union operation makes for a relatively easy logical problem; the intersection of three subsets or the union of three subsets can be visualized without substantial efforts.

On the other hand, the logic is a bit more demanding and complex when you're dealing with a combination of union and intersection.

Consider, for example, producing a report listing employees who have reached age 55 *or* have reached age 40 *and* have worked for your company for at least ten years. The English language statement of this problem is somewhat ambiguous: does the age 55 characteristic stand alone from the age 40 and ten-years-worked characteristics? Or are you given a choice on the age characteristic and no choice on the ten-years-worked characteristic?

By stating this in set representation, you get a much clearer picture of how the characteristics are related. Let A represent the age 55 characteristic, Y age 40 and W ten-years-worked and state the relationship as follows: A^(Y∨W). The alternative, which is (A^Y)∨W, offers a much different interpretation due to the fact that the parentheses impose a hierarchy of order of operations which causes you to act upon those items within parentheses first.

Also, the former representation states that the A condition *must* exist, while *either* Y or W needs to exist; in other words, the existence of A and Y *or* of A and W will suffice. In the latter representation, both A and Y must exist with W being optional, or if A and W are both absent then W must exist in order for the element to be present on your list. The Venn diagrams for A^(Y∨W) and (A^Y)∨W are shown in Figs. 5 and 6.

The Complement

One other concept relating to set theory completes the discussion: the complement. Every subset within a file is capable of describing its opposite by use of the complement notation.

For example, in an employee file there is a subset of female employees. The complement of that subset is all employees who are not in the female subset—male employees. The complement of that subset of employees who have reached age 40 is the subset of employees who have not reached age 40. The complement of employees who have worked at least 15 years for a company is those employees who have not yet worked that long.

The complement of a subset is denoted with a superscript, as in A^1. Thus, stating the set representation $(A \wedge B)^1$ describes that area outside the intersection of subsets A and B.

Returning to the original problem of designing a program to produce a list of employees who have worked for at least 15 years and who are at least 40 years of age, you can now represent the relationship with a Venn diagram.

The rectangle represents the universal set of employees in the company. From there, you can draw a circle to represent those employees in the proper age group (A) and a circle to represent those employees in the proper category for years worked (Y). You presume that the area of overlap exists: only after the data is processed

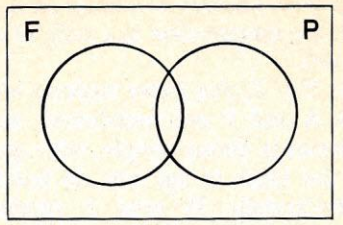
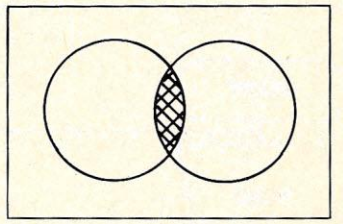


Fig. 1.


Fig. 2.

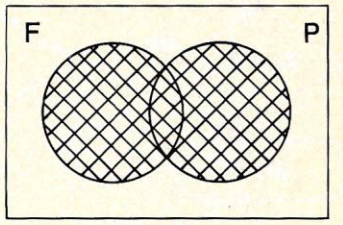


Fig. 3.

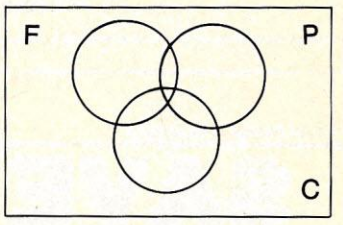


Fig. 4.

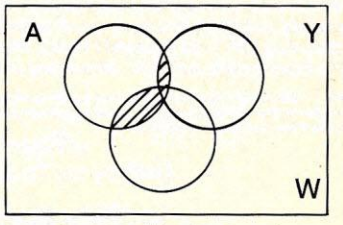


Fig. 5.

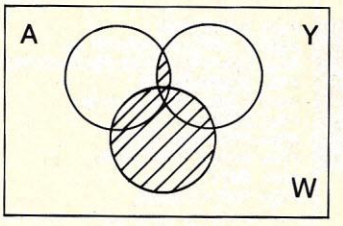


Fig. 6.

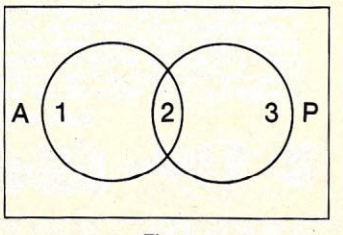


Fig. 7.

can you be certain that the intersection does contain elements (if it does not, the intersection is a null, or empty, set).

In Fig. 7, the three regions within sets A and P are numbered: area 1 represents those people who qualify on the basis of age but do not have characteristic P; area 2 represents those employees who have characteristics A and P; area 3 represents those employees with characteristic P but not A. Since you're trying to produce a list of employees who satisfy both conditions you must search your file for people who fall into area 2 (the intersection of A and P—A^P).

The next step in the program design is to work from the set representation and Venn diagram to write a flowchart, or Warnier diagram, to represent the program logic. Setting aside the question of efficiency for the moment, there are only two possible logic paths for this problem: you either begin with a condition check for A and then test for P, or reverse that path. The flowchart is shown in Fig. 8.

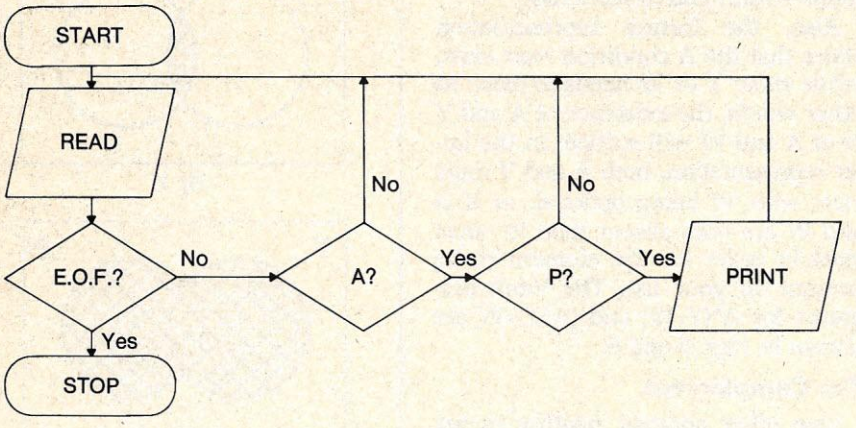


Fig. 8. A flowchart representing program logic.

The logic is quite simple in this program. After reading a record from the employee file and testing for an end-of-file marker, the record is tested for characteristic A. If A does not exist for this record, the logic follows the No path returning for another record. If the record does have A, there is a test for P, at which point the record will be printed if the condition exists or another record will be read in if P does not exist. After the last record, an end-of-file marker will send the flow to Stop, where execution will terminate.

The condition checks in Fig. 8 can be reversed without disrupting the basic logic of the program. The critical point is that a record must have the appropriate characteristics of A and P in order to be placed on the output report. Without one of the characteristics a record is dismissed from further testing and printing, and a new record is processed.

You can streamline the operation if you have knowledge about the number of records having certain characteristics. For example, if you know that in the file there are 100 records with characteristic A and 50 with P, it is more efficient to test for P first. If you test for A first, then 100 records have to be sent forth to be checked for condition P. If you check for P first, only 50 records are sent forward to be checked a second time.

There are actually fewer comparisons made with the latter pattern. The difficulty here is that such numbers are normally not available so that you can make decisions on program logic based upon numbers within particular subsets.

This is admittedly a simple program requiring minimal interpretation, but the techniques used to do simple programs will put you in good stead to do more complex ones.

What you now have in hand is a basic understanding of the concepts of sets and subsets and their union, intersection and complement. By judicious and appropriate use of these concepts, the task of designing programs should be easier.■

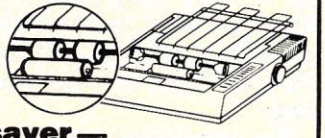
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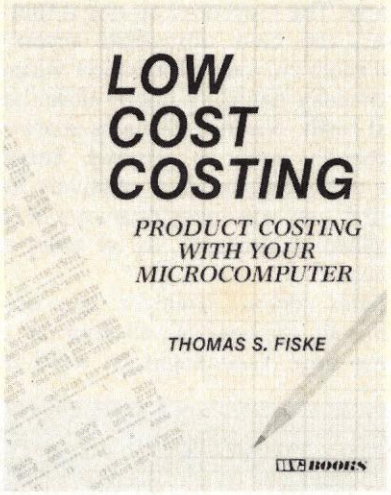
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Gad Zeus

The Zeus 4, from OSM Computers, is a four-user system that gives each user his own Z80 microprocessor and 64Kb of memory. In short, this system is all it claims to be.

By Michael Heck

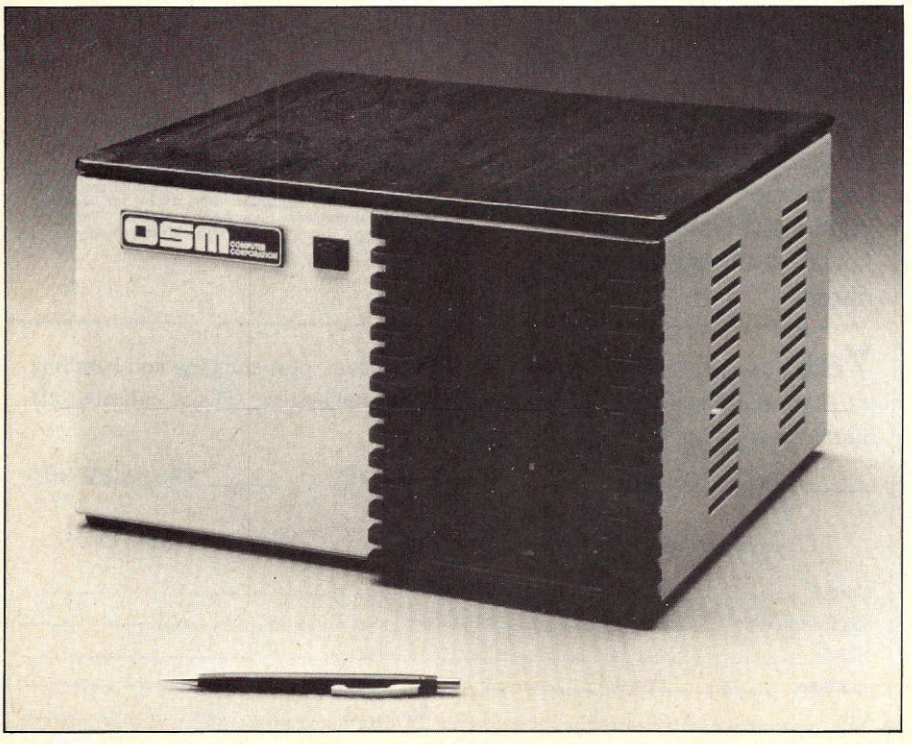
Claiming to be a multi-user system is one thing, proving it is quite another. I'll tell you right now that the Zeus 4 is what it claims to be. Many "multi-user" systems share one microprocessor among all users, sacrificing performance. But the Zeus 4, which is designed for four users, gives each user his own microprocessor and 64Kb of memory. In effect, each user has his own personal computer.

The system is designed around a hard disk unit that stores the files for all users. One processor card contains all the electronics normally required for four standard microcomputers, including the four Z80 microprocessors and a total of 256Kb of memory. (Other members of this family expand to accommodate up to 32 users.)

The advantages to this design are many. The most obvious one is that all users can have immediate access to the most current information without physically shuttling floppy disks back and forth. Second, all users share peripherals, such as printers, keeping the overall system cost relatively low. Third, you only need one copy of any application program, as all users can access it.

Each person, however, can use a different application—all four at the same time. One might be word processing, another analyzing a spreadsheet and so on. This is possible because the individual computers operate independently.

A controlling program within Zeus oversees the entire operation, checking, for example, to ensure that two people do not try to update a disk file at the same time. In reality, though, the operation of the control program is transparent to the user. The only difference between a single-user and multi-user environment is the addition of a few special commands (which I'll discuss later).



The Zeus 4 multi-user system occupies less than one cubic foot of desktop space.

A Look Inside

The Zeus 4 is impressive for many reasons. The first is size. The entire system uses less than one cubic foot of desk space. Naturally, the terminals, which are not included, take up additional space, but the Zeus is quite an accomplishment, considering what is inside this small box.

Besides the processor card, another printed circuit board controls the disk drives and communication with terminals and other peripherals, such as printers. A third board, the master processor module, which has capabilities similar to the single-user modules, supervises all requests for shared storage and peripherals.

The Zeus 4 comes with a hard disk unit capable of storing 6Mb. The computer can be upgraded to either 12Mb or 25Mb of hard disk storage.

The hard disk essentially has two

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big advantages. First, it stores a tremendous amount of data, an absolute necessity when servicing many users. Second, the hard disk can store and retrieve information many times faster than a floppy disk. This is an important factor when several people want to use the same information, because the faster transfer rate of the hard disk eliminates the waiting associated with floppy disks.

You will also appreciate the faster disk speed when running programs requiring much disk access, such as compilers and applications that go to the disk often to store intermediate results of sorting operations.

In addition to the hard disk, the Zeus 4 comes with a standard 5¼-inch floppy disk drive. You use it to transfer programs and data onto the hard disk (because most programs are supplied on floppy disks) and to make back-up copies of data stored on the hard disk. The standard floppy disk drive stores 250Kb of information and, optionally, 1 million characters.

The Zeus 4 sports a clean design. The three boards described earlier communicate through a single ribbon cable. Other simple connections are made from the boards to the disk drives and communication ports. Standard communication connectors open to the back of the unit, where the terminals and printers are attached.

The Zeus 4 power supply is placed outside the rear of the unit, keeping heat away from the main electronics and disk units. Thus, a fan isn't needed to cool the unit.

Two switches are the only visible controls on the Zeus 4: an on/off switch on the power supply and an illuminated reset button on the front of the unit (it restarts the system without shutting off the power).

The only problem I noticed with this otherwise efficient design is the way the processor and disk cards are installed. Rather than being plugged in, they are held in place with braces at the top and sides. The different cables then run to various connection points on each card. Removing a card to upgrade features or for servicing is not the easiest task.

Display Terminals

The Zeus 4 supports just about any terminal on the market. As some models are as low as $400, terminals are a small portion of the total system cost.

The first requirement for a terminal is that it handle standard RS-232C serial communications. With few exceptions, every terminal will do this. The next criterion is the speed at which data is sent between the computer and terminal. The Zeus 4 can transmit and receive information at speeds between 300 and 9600 bits per second. It is best to set the terminal for maximum speed.

For this evaluation, I used a variety of terminals—Heath, Tandy, Lear-Siegler and IBM. Once connected properly, all worked as expected, and performance did not appear degraded when the four terminals were used simultaneously. In general, pay attention to the wiring of cables and make sure the terminal is set for the same speed as the computer.

The Zeus 4 features the ability to have each terminal communicate at a different speed. The Zeus 4 manuals describe the proper connections and settings. Also, prewired cables are available from a number of sources.

The Zeus 4 accommodates up to four user terminals (two ports are standard per user) and a master console. The console has a separate printer associated with it. One other printer is available on a basic system (assigned to user -1), but Zeus 4 can be optionally expanded with three additional user printer ports (one for each terminal).

MUSE and CP/M

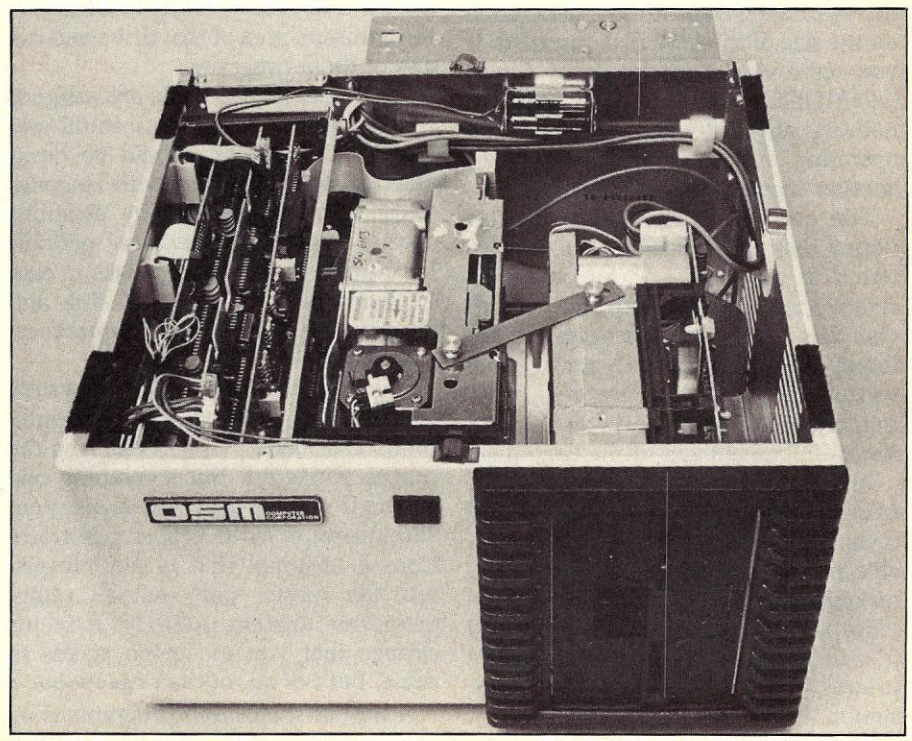
Sometimes the operating system and available software are the most important factors in deciding what computer to purchase. Regarding OSM, the choice has been made a bit easier. OSM has modified the MP/M operating system, a multi-user version of CP/M, to run on the Zeus 4.

MP/M manages access to the disk, controls screen display and so on in the same way CP/M does for a single user. This modified operating system is called MUSE (Multi-User System Executive). Because MUSE is compatible with CP/M and MP/M, a number of software applications are open for possible use on the Zeus 4.

You have a choice of database management systems such as dBaseII and DataStar, word processors such as WordStar and spreadsheets such as Multiplan and SuperCalc. All these applications will work on any CP/M-compatible machine, regardless of the manufacturer. I tested WordStar, dBaseII and SuperCalc on the Zeus 4, and all operated properly.

The difference between CP/M and MUSE involves a special set of commands for accessing various areas on the hard disk and for security purposes. When a number of users have access to a system, it is important that only qualified persons be able to access sensitive information.

After you switch on the computer, the hard disk loads MUSE into the master console processor after about 15 seconds. At this point, any terminal can sign onto the system. The



A topless look at the Zeus 4.

system recognizes a terminal when you press that terminal's break key several times.

The MUSE logo appears on the screen, along with a request to enter your "user name" (actually, it's a number). One-hundred-twenty-six individual areas are available. Each of these has a private file directory, even though all files are physically on the same hard disk. In essence, 126 people can have their own programs and data on the system without anyone else having access to that information.

Since anyone can type in a user number when signing on, a special password can also be assigned as an added security measure. If you can't give the proper password, the system won't recognize you.

Information that can be shared is placed in a common area. Usually programs and frequently accessed data files are placed in the common area.

MUSE's directory management system supports more than 1,000 CP/M entries per logical drive, with instantaneous access to any file. Usually CP/M refers to the first floppy disk drive as A, the second B, and so on. Each one is physically and logically different. If you wanted to run a program called Invoice, which was on the floppy disk in drive B, you would type "B:Invoice."

Zeus 4 has one physical hard disk, but it is divided into several logical drives ranging from A to D, depending on the size of the hard disk installed. If you were working with drive A and told MUSE to look for a file on drive B, nothing physical would happen; the operating system would just go to another section of the hard disk.

The one exception is the physical floppy disk drive installed in the system. It is called drive P, keeping it far removed (in your mind) from the hard disk files. Any user has access to the floppy disk, but it is wise not to use it except for back-up purposes, as it quickly becomes full and you sacrifice the speed advantages of the hard disk.

Another important facet about MUSE regards printing. Printing a document or report can take considerable time, especially using a slow letter-quality printer, but MUSE provides a technique that allows special files to be sent to the master console's printer, thereby freeing the user station.

To use the Zeus 4 effectively, you only need to be familiar with CP/M and your specific applications. The special commands added by MUSE are easily mastered. For instance, if you log on to a particular user area and want to view the common files, you type a slash mark after the drive prompt (A>). You then see a new prompt (*A>). At this point, you can ask for a directory listing of all files in the common area of that drive and run any of those programs.

Some special functions are assigned to the master console. In a multi-user system, one person should be designated system manager, with responsibility to control access by assigning special passwords, perform periodic back up of files to floppy disks in case of problems with the hard disk and handle a number of other housekeeping tasks.

Any terminal can act as a system console by signing on with the appropriate user code (32) and entering the proper password. But something odd occurs if you are working as a system administrator (with proper password) from a terminal that is not plugged into the master port—not all utility programs function properly. It seems strange that you are given access to some, but not all, needed functions.

A host of specialized programs is included with the Zeus 4. The system is delivered with several copies of these programs installed in the common area of the hard disk. Copies are also supplied on four floppy disks in case of problems with the hard disk.

Besides the expected utility programs to copy disks, assign passwords and set the time and date of the built-in clock/calendar, there are some unique offerings. The Mail program is used to send electronic mail among users on the system. If you have a message, this is indicated when you sign on.

Another program, Telecom, allows access to other computers, including mainframe systems, and controls data transfer between the computers. Other special offerings are used to format and restore the hard disk in the event of a problem and to make automatic backup copies of programs and data from the hard disk to the floppy disk.

Documentation

Disappointing is the only way to describe the Zeus 4's manuals. First, these books, which include the reference manual for MUSE, MUSE System Manager reference manual and the Zeus 4 user's guide, aren't printed, but are copies of typewritten pages. Second, they can be utilized by someone well versed in MP/M and hardware design, but are almost totally useless by someone with less than an engineering degree. Even though I have a good background in hardware, I spent the entire day trying to decipher the many interface descriptions and other technical facts in order to set up the Zeus 4.

My recommendation is to have your dealer assist you. Then find a well-written book to guide you from that point. The MUSE reference manual can also aid in using the utility programs.

The Final Evaluation

The Zeus 4, despite the problems with the manuals, has many positive points. First, it compares favorably to other multi-user CP/M systems because of its four microprocessors and individual memory. Second, OSM scores numerous points by including a hard disk in the basic system. Most manufacturers offer the hard disk as an option, but you really cannot operate efficiently in a multi-user environment without a hard disk. Third, considering that the Zeus 4 costs what a hard-disk unit alone cost about a year ago, it is economical.

Most of all, as we stated earlier, the Zeus 4 is all it claims to be.■

A Capsule Look At the Zeus 4

Manufacturer
OSM Computer Corp., 665 Clyde Ave., Mountain View, CA 94043.

Price
$5595 for base system (two users); $1000 for each additional two users.

System Unit Features
Z80 microprocessors, running at 4 MHz; MUSE operating system (compatible with CP/M and MP/M); 64Kb RAM, expandable to 576Kb.

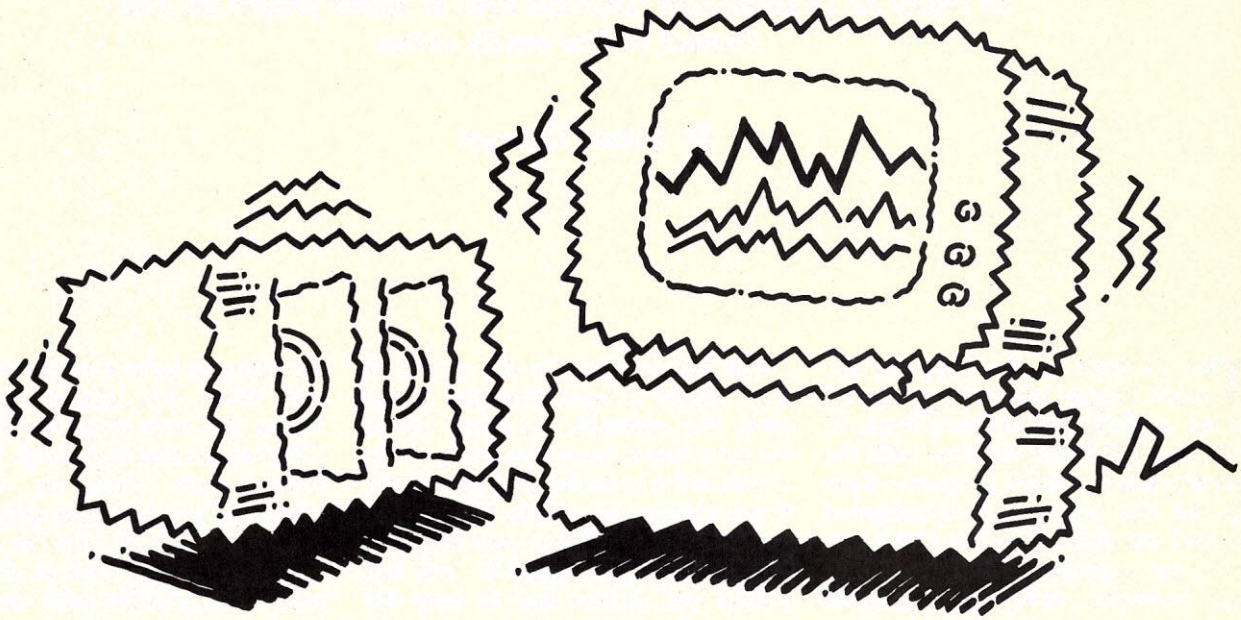
Mass Storage
6-25Mb hard disk; 5¼-inch floppy for backup; 250Kb eight-inch floppy optional.

Input/Output
Two RS-232C serial ports available per user; two master serial ports; bit rates from 300 to 9600 bps, hardware jumper selectable. One parallel port per board; one master parallel port.

Physical Characteristics
Size: 8×13×15 inches.
Weight: 25 pounds.

Expansion
The Zeus 4/16 can run eight- and 16-bit operations concurrently and accommodate up to eight users.

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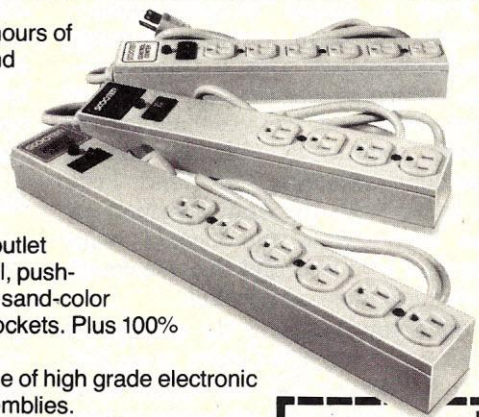
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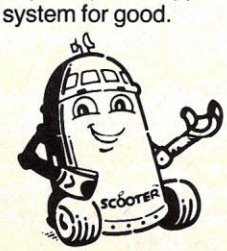
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Kaypro: All Keyed Up

Kaypro's own Config program and a few Hex codes can produce as many as 14 dedicated function keys to make programs like Perfect Writer really shine.

By Robert Gaissert

The 14 keys of the Kaypro's numeric keypad can be programmed to act as dedicated function keys. In fact, the CP/M disk supplied with the Kaypro has a special program—Config—for this purpose. A reconfigured keypad can make your computer easier to use, especially for word processing; however, many Kaypro users don't know how to take full advantage of the keys. What makes this situation doubly unfortunate is that Perfect Writer, the word processor most commonly used with the Kaypro, is designed to facilitate changes in all its command key assignments.

Config allows you to program each key of the keypad to represent whatever character you wish. First, look up the hexadecimal code of the desired character on an ASCII code chart (never mind if you don't have an ASCII code chart; read on) and convert the number to hexadecimal form.

When you run Config to reconfigure the keypad, you are presented with a graphic representation of the keypad with the preset hex code for each key.

You simply plug in the new hex code where a new character is desired. For example, the graph shows the enter key to have a hex code of 0D, which is the code for carriage return. If you change the code to 18, the code for Control-X, pressing your keypad's enter key sends Control-X. You can change yet another key to have the code of Control-C, which is hex 03. When your new keypad is in effect, you can exit Perfect Writer with only two keystrokes instead of three.

Even a simple reconfiguration—where the keys merely represent single characters such as Control-X—can reduce by a third the number of keystrokes required to execute Perfect Writer commands. Although you do lose time whenever your hands have to move from the home position on the keyboard to the keypad, with practice, you will find the movement faster and more convenient.

After you complete the changes to the keypad graph in Config, press ESC to exit. Pressing ESC once again leads Config to ask if you are ready to save the changes you've made to the keypad. When you answer yes, Config writes the new configuration to the CP/M of the disk in drive B. Your new keypad will then be in effect whenever you cold boot with that disk in drive A—that is, turn the computer on and place that disk in drive A, or reset the computer with that disk in drive A.

If you sysgen from a disk whose CP/M contains the altered keypad, the new system disk will also contain the alteration. You can have different configurations on different disks—and happily so, for your Perfect Writer keypad configuration will probably be inconvenient for entering figures on a PerfectCalc spreadsheet.

Char	Name	Function	Description
0	C-@	MSETMARK	Sets the mark at the point
47	/	MINSERT	Inserts the character at the point
129	M-C-A	MNOTIMPL	"Unknown command"
259	X-C-C	MEXIT	Exit Perfect Writer

Table 1. Typical entries in FUNCTS.TXT.

Multiple-Character Commands

Ideally, you'd like your Perfect Writer keypad to contain keys that represent more than one character. Although some Perfect Writer commands are just one character (albeit two keystrokes), such as Control-A to go to the beginning of a line, others are not. Exiting Perfect Writer normally requires two characters—Control-X and Control-C—and at least three keystrokes.

But wouldn't having one key represent both characters in the appropriate

Address correspondence to Robert C. Gaissert, Pang Computers, 135 Commerce Plaza, 5865 Jimmy Carter Blvd., Norcross, GA 30071.

sequence require two hex codes per key? Thankfully, the answer is no. It turns out that Perfect Writer has one hex code for each command, even when the command seems to require a combination of characters. The problem, then, is to find out what the exact code is for a given command.

Put a Hex on It

There's an easy way to find out the hex code for a given Perfect Writer command. You need the Perfect Writer FUNCTS.TXT file, which is found both on your installation disk and in an appendix in your Perfect Writer manual. If you use the copy on the installation disk, be careful not to alter it in any way. You may wish to print a working copy and mark it freely.

FUNCTS.TXT lists all the Perfect Writer commands. It has four columns: Char, Name, Function and Description. The commands are sorted by numeric character from 0 to 383. Some typical entries are shown in Table 1.

The Name column indicates the key or key combination that invokes the command. C-, as in C-@, means Control; M-, Escape; X-, Control-X. The Function column is really a listing of names that PWBIND will check against the listing PW.SYM later on.

The Description column indicates the actions executed by the commands. The Char column indexes the commands, but its usefulness extends much further: in FUNCTS.TXT, the character code of a Perfect Writer command is a decimal code that, when converted to hexadecimal, will invoke the command.

To find out the hexadecimal code of any Perfect Writer command, first look up its decimal code in the Char column of FUNCTS.TXT. Then convert it to hexadecimal, using the conversion chart in Table 2.

To use the conversion chart, first find the largest decimal value that will divide the decimal code of the Perfect Writer command in question. Write down its hex equivalent and its column number. (The columns are purposely numbered from right to left, so column 2 on the chart will be your column 1 going from left to right.) Make the decimal division and then repeat the process with the remainder, if there is one.

For example, suppose you wanted the hex code for the Perfect Writer command Beginning of Buffer, which is ESC-< on the keyboard. According to FUNCTS.TXT, the decimal code for this command is 188. The largest decimal number in the table that will divide 188 is 176 in column 2. Its hex equivalent is B. Now divide 176 into 188 and you have 12 as the remainder.

In column 1 of the table you see that 12 exactly divides this remainder, so there are no further remainders; the hex equivalent of 12 is C. Therefore, the complete hex code for Beginning of Buffer is BC. Since this is a two-character code, you can use Config to make any keypad key represent Beginning of Buffer by replacing its code with BC. A Perfect Writer command that once took three keystrokes now takes only one.

Those Large Hex Codes

Another problem soon presents itself, however. Some of the most useful Perfect Writer commands have character codes larger than the largest decimal number in the table, which only goes to decimal 255 (hex FF). If you expanded the conversion table to

7	8	9	-
C-A	C-C	ESC-Q	C-B
4	5	6	,
C-Z	C-V	ESC-<	ESC->
1	2	3	
ESC-<SB>	C-W	C-Y	
0	.	ENTER	
C-X C-F	C-X C-C	C-X C-W	

Figure 1. Suggested keypad for Perfect Writer.

Hexadecimal Columns

	1 /		2
	hex = dec /		hex = dec
0	0	0	0
1	16	1	1
2	32	2	2
3	48	3	3
4	64	4	4
5	80	5	5
6	96	6	6
7	112	7	7
8	128	8	8
9	144	9	9
A	160	A	10
B	176	B	11
C	192	C	12
D	208	D	13
E	224	E	14
F	240	F	15

Table 2. Decimal-to-hexadecimal conversion chart. Note that columns are purposely numbered from right to left.

Char	Name	Function	Description
129	M-C-A	MNOTIMPL	'Unknown command'
130	M-C-B	MNOTIMPL	'Unknown command'
131	M-C-C	MNOTIMPL	'Unknown command'
132	M-C-D	MNOTIMPL	'Unknown command'
133	M-C-E	MNOTIMPL	'Unknown command'
134	M-C-F	MNOTIMPL	'Unknown command'

Table 3. Items in FUNCTS.TXT.

Char	Name	Function	Description
129	X-C-C	MEXIT	Exit Perfect Writer
130	X-C-F	MFINDFIL	Find File
131	X-C-W	MFILEWRI	Write File

Table 4. Perfect Writer commands and hexidecimal codes.

three columns, you would be able to discover the hex codes for Perfect Writer commands with decimal codes larger than 255. But since Config doesn't accept a three-character hex code for reconfiguring the keypad, knowing the larger codes isn't helpful. The newer Kaypro 10s have an enhanced Config that eliminates the need to know hex code and enables the user to program a key to send up to four characters.

Even this problem can be solved with a little patience. PWBIND, also on the Perfect Writer installation disk, configures the keys on the Kaypro keyboard according to the listing in FUNCTS.TXT. You can change the hex code of any command simply by moving it to another decimal code in FUNCTS.TXT.

The way to get the upscale commands onto your keypad is to move them down in FUNCTS.TXT so that their decimal codes are less than 255. Doing so is possible because many of the below-255 commands are merely commands to display "Unknown command" on the screen. Consider items 129–134 in FUNCTS.TXT, shown in Table 3.

You could move some of the more useful Perfect Writer commands, whose standard hexadecimal codes occupy three characters, into these decimal codes. See Table 4.

You'll find that even if you change the names, the original key sequence remains the same. In this example the sequence M–C–A will now invoke the Exit Perfect Writer command even though the name at decimal 129 is X–C–C. You should make no changes to the Char column, since Perfect Writer won't accept them and leave the original Char codes of these moved commands as they are. The idea is to *replicate* the command functions at the lower code positions. So, when your keypad is reconfigured, you will have three ways to execute a command: with the original keyboard sequence, with the new keyboard sequence and with the keypad key.

Editing FUNCTS.TXT

As background for editing FUNCTS .TXT, read the section in one of the Perfect Writer manuals' appendixes entitled "Changing the Command Keys." I recommend the following procedure. First, plan your proposed keypad on a keypad diagram. Put typical keystroke sequences together and be conscious of mnemonics. The arrangement in Fig. 1 allows typical sequences to be executed efficiently.

> Learning your new keypad can be easy . . . and with your new set of dedicated function keys, you'll enjoy editing with Perfect Writer more than ever.

To go to the front of a line, delete the line. Reforming the paragraph simply requires a keystroke sequence of 7-8-9; the set mark, wipe region, yank back sequence is just 1-2-3. Enter suggests writing (entering) a file on disk; the 0 suggests a vacancy to be filled by a new file; a period suggests an end, hence an exit from Perfect Writer. Learning your new keypad can be easy!

After planning the keypad, plot the changes you will need to make on a listing of FUNCTS.TXT and translate the appropriate decimal codes into hex. Format a blank disk to be your permanent keyboard modification disk, which I'll call the KM disk. From your Installation disk and your Perfect Writer edit disk, copy the following files onto the KM disk: PW.COM, PW.SWP, PWBIND.COM, FUNCTS .TXT, and PW.SYM. *Important*: use the KM disk for all modifications to FUNCTS.TXT, so that mistakes won't hurt your working original.

Incidentally, the versions of PW .COM, PW.SWP, and PWBIND should all be the same. If you modify version 1.033 or version 1.20 of PW.SWP with version 1.03 of PWBIND, you will encounter problems. It's useful to have a copy of CP/M's PIP on the KM disk; if you want PW.HLP updated, copy it onto KM as well. Now put the KM disk into drive A and type PW FUNCTS.TXT. FUNCTS.TXT then appears on your screen, ready for editing by Perfect Writer. Change the editing mode from Fill to Normal.

The editing of FUNCTS.TXT must be precise. PWBIND, which checks your work and makes the relevant changes to PW.SWP, doesn't forgive errors. Move the cursor (forward search) to the "Unknown command" you are going to change first and then move the cursor to a position immediately in front of the Char column, since you are going to change only the Name, Function and Description columns. Use Control-C to delete these columns.

Next, move the cursor down to the command you are going to replicate. Position the cursor in exactly the same position as above, and delete the Name, Function and Description of the command with Control-C, but yank them right back with Control-Y. This way the command will still be bound to its original key sequence. Reverse-search your way back to the original deletion and yank the new command back into position. Be certain that all the columns line up exactly. Again, do not alter the Char column. Although you may *move* the names, do not alter them either.

Repeat this process for all the commands that have decimal Char codes greater than 255 that you want to use on the keypad; then write the new FUNCTS.TXT to disk. You may find that you want more dedicated function keys than there are keys on the keypad. If so, you may alter FUNCTS. TXT to dedicate one or more of the keyboard keys to the functions. I bound the Print Current Position function (Char code 317) to my reverse-slash key (Char code 92), which I otherwise would never use.

After FUNCTS.TXT is written to disk, exit Perfect Writer and execute PWBIND. If PWBIND finds no errors, it will effect the changes you've made. The changes are made to PW.SWP rather than to PW.COM. It's a good idea to check whether the changes have been made satisfactorily before going on to reconfigure the keypad with Config. You can do this by opening a new file on the KM disk to edit with PW and typing the modified key commands that formerly produced "Unknown command." If the modifications have been made as desired, put your working Perfect Writer Edit in drive B, erase B:PW.SWP and, using PIP, replace it with the modified PW.SWP on the KM disk. While the edit disk is still in B, put the CP/M disk in drive A, execute Config and type the new hex codes onto the edit disk. When you want your new keypad in effect, cold boot the Kaypro with this disk in drive A.

With your new set of (at least) 14 dedicated function keys, you'll enjoy editing with Perfect Writer more than ever!■

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Tandy's Sweet P

The TRS-80 Model 4P is actually a Model 4 with wanderlust. Built for travel, the 4P comes in a rugged 26-pound suitcase. This 64Kb, Z80-based system also features multiple personalities—it can run Model III, Model 4 and CP/M-80 software.

By Eric Grevstad



Radio Shack's Model 4P.

It's not nice to kick Osborne owners when they're down, so don't show them the TRS-80 Model 4P. The newest member of Radio Shack's venerable Model I/III/4 line is not only one of the nicest transportables around, it's good enough to upstage desktops like the Model 4. In fact, I think it's the best eight-bit computer you can buy and a worthwhile rival to more costly 16-bit machines.

In the past year, Tandy Corp. has smashed its stodgy image with the ground-breaking Model 100 portable and the super-powered MS DOS Model 2000, but the firm has kept its conservative side as well. The Model 4P is no technical *tour de force*; it's a Model 4, 1983's upgrade of the trusty Model III, packed into a 26-pound suitcase.

Like the 4, it features a Zilog Z80A processor, 64Kb RAM (expandable to 128Kb) and a split personality—the ability to run Model 4 and CP/M software with a 4 MHz clock speed and an 80-column, 24-line screen display or Model III programs with that micro's 2 MHz speed and 64-column, 16-line display.

The 4P, however, costs less ($1799, compared to $1999 for a comparable Model 4), adds transportable convenience and looks prettier. If it had a terrible, Osborne-sized screen, there might be reason to buy the desk-bound model, but the 4P's nine-inch (measured diagonally) monitor is sharper and clearer than its cousin's 12-inch one. Schools will probably buy the sturdy 4, but the 4P's stolen its thunder for other markets.

Inside the Suitcase

Packed for travel, the 4P looks more like a sewing machine than a suitcase. There's a strong, reasonably comfortable carrying handle, spring-loaded to stay flush with the case when not in use. The whole package measures 16½ by 13¼ by 9¾ inches, small enough to fit under most airplane seats.

Like other transportables, the 4P is a bit heavy for long-distance hauling—carrying it from the office to your car or from the arrival gate to a cab is easy enough, but avoid those commuter airlines with gates at the far end of the

airport. (Carry an umbrella on rainy days, too; there are ventilation slots on one side.)

The case, made of off-white ABS plastic, seems rugged enough to be swung onto a desk or into a car. My 4P's survived a dozen such bumps, including a few thuds into the desk when I didn't heft it quite high enough, but I don't throw it around the way I do my canvas briefcase.

The 4P rests face down, with its back panel as its top. A hinged door below the handle conceals the parallel printer, serial RS-232C, hard disk and optional internal modem interfaces and the socket for the ac power cord. A hole in the panel lets the ac cord through if you have no peripherals connected and want to close the door over the other ports.

Two metal latches keep the 4P's lid fastened. The space inside the lid isn't wasted: there's a trough that holds the power cord and two slots marked "Manual" and "Diskettes." The former holds the pocket-sized "Portable Reference Guide," a crib to TRS DOS and Basic commands. The latter is an inch too close to the rim—it carries four or five floppy disks, but you'll have to bend them slightly to get them in or out. (I use the slot for the two cardboard disks supplied for cushioning the drive heads during travel.)

Unveiled, the 4P presents a study in black and white. Both the monitor (if you're waiting for a green- or amber-screened Radio Shack micro, keep waiting) and the recessed panels on either side are handsomely turned out in flat black, contrasting with the off-white case.

Left of the monitor are handy brightness and contrast control knobs and rocker switches for power and system reset. The large power switch lights up when the 4P's on, while the small reset switch is recessed to make accidental reboots practically impossible. Even intentional reboots will be awkward for those with fat fingers or long nails.

To the right of the screen are the 4P's two vertically-mounted, half-height Tandon drives—single-sided double-density units—providing 184Kb of unformatted storage each (a disk formatted by the 4P's operating system, TRS DOS 6.1, has 174Kb of free space). The drives are rather noisy (particularly in Model III mode), but they look better and their lights are brighter and easier to see than the Model III's. They've also served reliably through a month of heavy use, even delivering disk I/O through several power line fluctuations that left the screen flickering badly.

I like the 4P's drives, but I'll never buy a third one. Unlike the Model 4, the 4P has no provision for external floppy drives (and no cassette port, either). Tandy believes that transportable users are unlikely to tie their machines to three or four floppies, though someone who takes a 4P home might want a hard disk database at work. Hence, owners can connect up to four of Radio Shack's 5Mb Winchesters.

Great Board, Short Cord

When it comes to keyboards, I admit to being a TRS-80 loyalist (or at least an enemy of IBM's ungodly layout and tinny telegraph noise). The 4P's 70-key unit has a numeric keypad, clear, control, caps lock and three programmable function keys, but, more important, it feels terrific—crisp, fast and accurate.

It's softer than the metallic-feeling PC keyboard, but not mushy. It's also quieter, though using the 4P is not a silent experience. (Besides the keyboard and drives, there's a fan—a minor distraction at first, but reassuring white noise when you consider Apple owner's tales of overheating.)

When not in use, the keyboard fits in a shelf beneath the screen. You can pull it out and leave it flat on the desk or swivel two plastic legs into position to prop it at about a ten-degree angle. Most typists will find the latter more convenient.

A few may try putting the keyboard in their laps but won't be happy. It's not really detachable, as others are, though you can put it at an angle to, or a few inches from, the system unit. The 14-inch cord is too short to reach your lap unless you move the 4P to the edge of your desk, and even then you have to sit close instead of leaning back.

Muttering about semidetachable keyboards illustrates one of my points: The 4P has few hardware deficiencies to complain about. As I've said, the keyboard feel is excellent and the video display, both in 80- and 64-column modes, is first-rate. There's even an onboard speaker with sound (pitch and duration) accessible from Basic; the 4P introduced me to all the noisy, talkative or musical games I couldn't hear on a Model III without connecting a cassette amplifier.

Anyway, there are hardly any hardware options. Besides hard disks, 4P owners can choose memory expansion to 128Kb ($79.95 plus installation), a high-resolution monochrome graphics board and software ($249.95 plus installation), or a user-installable direct-connect 300 bits per second (bps) modem ($149.95).

Two TRS-80s in One

Now the story gets complicated. There are more than a few software options. The 4P can run more than half a dozen operating systems with programs divided into three categories—Model III (64-column), Model 4 (80-column) and CP/M-80.

The Model III had a pretty good Basic in ROM, and the Model 4 has an entire Model III—the complete ROM image of the older model, which loads automatically, turning the 4 into a 2 MHz, 64 by 16 micro when you boot a Model III system disk.

The 4P has little in ROM except trilingual error messages. At startup with the drives empty, for instance, "The Floppy Disk Drive Is Not Ready" appears in English, German and French. It won't boot Model III disks. For that matter, it won't boot (though it can read) Model 4 disks containing last year's TRS DOS 6.0 instead of TRS DOS 6.1.

However, TRS DOS 6.1 contains the complete Model III ROM, Basic and all, in a large (15Kb) file called MODELA/III that can be transferred to TRS DOS 1.3 disks to create self-booting Model III software. Other Model III disks (such as DOS PLUS, NEW DOS/80, LDOS or MULTI DOS) can be used after loading the Model III mode from TRS DOS 6.1, a matter of pressing reset, F3, and a lowercase p in quick succession.

The 4P loads the ROM image and prompts you (in three languages) to swap disks. Pressing enter will boot a Model III disk and pressing break will yield Model III Basic. (Similarly, pressing reset and a lowercase n will boot TRS DOS 6.0 disks.) If the 4, with its Model III ROM, leads two lives, the 4P achieves the same effect as a RAM-based disguise artist.

Everything You Wanted In a DOS and More

Such versatility takes its toll. TRS DOS 6.1 is huge, filling all but 36Kb of a disk, and in some applications it hogs memory space. Its RAM-based Microsoft Basic 5.0 is a fast and powerful version, supporting advanced commands like While Wend, but can

address only one bank (32Kb) of user memory, even in 128Kb machines. This gives less space for Basic programs than the 48Kb Model III did. Memdisk, TRS DOS's "phantom disk" feature that allows ultrafast file retrieval from extra memory space, is practically unusable without the 128Kb expansion.

Memdisk is a good example of TRS DOS 6.1's bells and whistles. I'm pleased with the DOS's terrific power but wish it left more room to store files on system as well as data disks. (A one-disk Model 4P would be useless.) I also wish it were easier for nonhackers, who'll be baffled by its complexity and unwilling to wade through the "Disk System Owner's Manual," a massive three-ring binder, laudably complete but loosely organized.

I'll give two examples. Hackers will quickly delete TRS DOS 6.1's Basic Maillist program, which is pretty clumsy as a database application—you call files by number, not by fields such as name or address. But it's nicely menu-driven and easy to use. It forms an excellent start for a beginner learning to run programs and enter data, precisely its role in the commendable "Introduction to Your Disk System," a slim paperback that covers startup and a few elementary DOS instructions.

On the other hand, the full-featured communciations program, COMM/CMD, is a holy terror. Before running it, you have to flip to Appendix I in the manual and prepare the RS-232C (SET *CL TO COM/DVR), then adjust specs such as bit rates with SETCOM (BAUD=300,WORD=7) or whatever, and then struggle with COMM/CMD itself, which is as hellishly complex as any software I've seen.

I plan to master TRS DOS's print spooler and job control language (though I'm still learning the difference among JCL, KSM and Build commands), but I found a nice third-party, menu-driven terminal program. I'll never touch COMM or SETCOM again.

TRS DOS 6.1's designer, Logical Systems, Inc. of Milwaukee, WI, offers a small version of its LDOS 5.1 for the Model III with common commands such as Backup and Format and lots of room for user files. I'd bet that many Model 4P owners would welcome a small 6.1.

CP/M, Probably; MS DOS, No

Besides the sizable Model III library and new Model 4 programs (and even single-density Model I files read with TRS DOS's Repair command), the Model 4P promises access to the vast base of Z80 CP/M software. Unfortunately, I can't say much about the subject; when it comes to the time lag between announcement and availability, CP/M has turned out to be Tandy's answer to VisiOn.

> There's one worry in my otherwise rave review: The 4P's superb, but I don't know what its resources will be in five years.

The Model 4 made its debut in April 1983, and Radio Shack promised CP/M Plus—the full 3.0 version, easier to use and with better file handling than CP/M 2.2, and able to address a full 128Kb—by that summer. Fall came, then winter, and at this writing CP/M Plus had made it into the TRS-80 catalog (at $149.95, with CBasic another $99.95), but not yet into the stores.

Rumors of pesky bugs and multiple rewrites by Digital Research, Inc., and subcontractors abound. Tandy, usually faultless as far as delivering products but perhaps sobered by one earlier brush with bugs—there were a lot of complaints about the first release of Model III SuperScripsit—has vowed to iron out the last problems and put the DOS on sale soon.

(As this review went to press in early February, Tandy's software product planner said that CP/M Plus had finally reached the warehouses.—Eds.)

Meanwhile, Montezuma Micro, a Camp Verde, AZ, Radio Shack dealer, has rescued impatient owners by offering CP/M 2.2 in a version that fits 64Kb machines for $199. A Tandy spokesman I met at Comdex/Fall in November claimed the Montezuma product wasn't perfect, but buyers and reviewers have given it high marks, particularly on its ability to read, write and copy IBM, Kaypro, Osborne and other manufacturers' CP/M disk formats.

CP/M will be important to Model 4P owners in the short term, but I don't think it'll ensure the 4P's future in an MS DOS world. I'm stodgy enough to feel that eight-bit machines are fine for 80 percent of micro users and applications—the 4P's clock speed, 4 MHz, nearly matches the IBM PC's 4.77—but it's clear that 16- and 32-bit chips are where the action is. That's the one worry in my otherwise rave review: The 4P's superb and its software library today is tremendous, but I don't know what its resources will be in five years.

I doubt there'll be any new CP/M-80 products ahead; Radio Shack, pragmatically, is downplaying CP/M's role in attracting Model 4/4P software. (Ed Juge, Tandy's director of computer merchandising, told *80 Micro* last summer, "I don't think anybody goes into using CP/M with the idea that anybody's going to come out with a lot of new material. You do it to use existing software.")

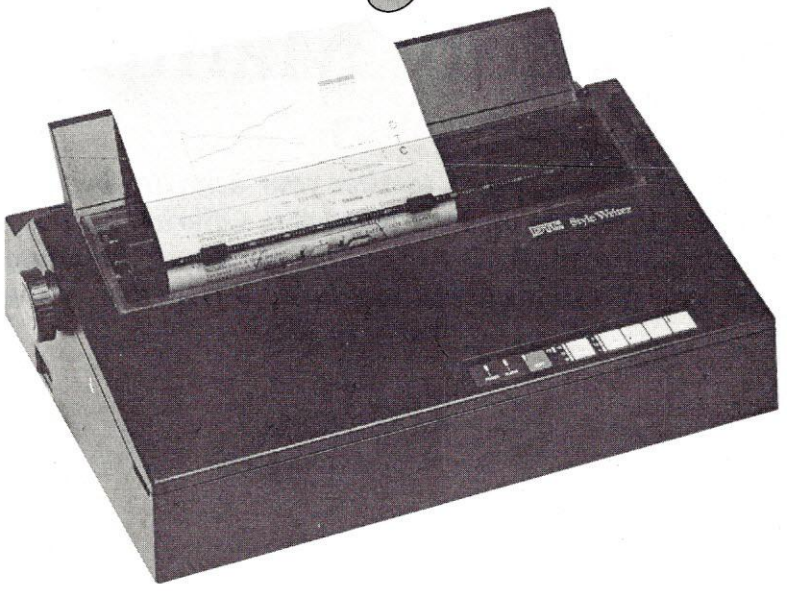
That leaves the 4P with today's CP/M and Model III programs and the prospect of new TRS DOS 6 software from Radio Shack and some outside publishers—perhaps quite a few publishers, judging from Tandy's recent drive for third-party items such as Multiplan, pfs:File and Alcor Pascal. It may not add up to much, but who knows? Apple's strong support of the IIe might lead Tandy to pull some integrated or other fancy packages from its sleeve, and it's likely that no other Z80 micro will get any new software at all.

For now, the 4P can take on all comers. The IIe has a large AppleDOS library and high-resolution color graphics but can't run CP/M without an add-on card; the 4P's also four times faster, has 30 percent more disk storage and is transportable. The Kaypro II costs $200 less and comes with 10 CP/M 2.2 programs, but the 4P offers access to Model III/4 TRS DOS as well as CP/M, not to mention Radio Shack's network of stores and service centers.

The 4P's shipping carton says that it's "The Ultimate Personal Computer"; even though I'm an admirer, I'll admit that's debatable. However, you can't deny the slogan on Tandy's Model 4P press release. It's "a microcomputer worth carrying about."■

Eric Grevstad (80 Pine St., Peterborough, NH 03458) is news editor for Wayne Green Publications' 80 Micro.

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Expando-Vision: User-Friendly Manipulating?

Expando-Vision claims to alter your behavior by flashing subliminal messages on your television. Offering cartridges that range from Stop Smoking to Sexual Confidence, Expando-Vision raises several questions about just how "interactive" we want our micros to get.

By Dan Muse
Microcomputing Staff

How do you review something you can't see?

That's the question I asked myself when I received Stimutech's Expando-Vision. I must admit that I was a little skeptical of the product. Who wants to be bombarded with subliminal messages as he innocently watches reruns of "Barney Miller"?

My next question was, "Am I qualified to review this?" Well, I have a Commodore-64; I have a television; and I certainly have plenty of bad habits. So my answer, obviously, was "Why not?"

The Expando-Vision package includes the Electronic Interface Device ($89.95) and a cartridge (you can buy one of eight, depending on what—or who—you want to conquer first). Each cartridge costs $39.95.

The Stress Control/Positive Thinking program came with my evaluation unit—a good choice. The other programs are Stop Smoking/General Health (I don't smoke); Weight Control/Exercise (I'm not in the same shape I was in when I was 16, but...); Stop Drinking/Responsibility (no thanks!); Athletic Confidence/Golf (my golf game needs much more help than a mainframe could give); Study Habits/Memory power (nah); Career/Success Motivation (I'll pass) and Sexual Confidence (where were you when I needed you?). Stress Control will do just fine, thank you.

Expando-Vision to the Rescue?

Eagerly, I rushed home to set up my Expando-Vision. It had been a long day. The magazine was behind schedule, my car got stuck in the snow and I was broke! "If I hurry," I thought. "I can get this all set up in time for 'Three's Company.' "

Attaching Expando-Vision to your television and computer is a snap. The product can be operated on antenna, video cassette recorder, video disk or cable systems. The television is connected to EID using a coaxial cable. The entire process takes about two minutes. If I give you a blow-by-blow description of how to connect Expando-Vision to your television and computer, I'll insult your intelligence.

Now you're ready to enter the fascinating world of behavior modification.

The program offers only three functions, which appear on your screen as R, S and D.

Pressing D will show you what messages will be flashed on your screen in intervals of 1/30 of a second. S interrupts your viewing to show you the next scheduled message and R returns the program to its starting point.

Back to Square 1

This brings me back to my original question, "How do I review something I can't see?" I used the program for a sufficient period of time. I may have suffered less stress during that period. It's not the kind of thing you notice. The most definitive thing I can say about Expando-Vision is that it may work.

Expando-Vision claims to operate under the premise that if the subconscious mind is intentionally programmed with positive thoughts, it will react to that information and behavioral modifications will take place.

Stimutech's literature cites an incident in a New Jersey theater as an example of the power of subliminal messages. In 1957, while the movie "Picnic" was being shown, messages such as "Drink Coca Cola" and "Buy Popcorn" were flashed on the silver screen too rapidly for the eye to perceive. It was reported that Coke and popcorn sales rose considerably.

I'm no psychologist, but I have

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some doubt whether or not Expando-Vision's messages actually are subliminal. Since I know what the messages are and when they will be shown, they aren't actually registering on my subconscious mind, because my conscious mind is aware that these sneaky little messages are on the way. The messages may still have an effect, but not on the subconscious.

The Expando-Vision functions better if used on an unknowing party—say a family member or a friend—as long as he doesn't know the subliminal messages are being flashed. Of course, you will have a hard time explaining why your computer is on while you're watching TV. You'll also have to hide the EID from view. I guess the ultimate question is: Do you want to control your behavior or the behavior of someone else through mind control? Perhaps the term mind control is a little strong, but that's what Expando-Vision attempts to do.

Personally, I didn't feel comfortable with the thought that messages were trying to conquer my subconscious while I was watching Mr. Furley trip over the couch in Janet's, Terry's and Jack's apartment.

Paranoia began to sink in as I heard the barely audible sound of my C-64 humming away. Thoughts of *1984* and *A Clockwork Orange* danced through my head. "How do I know this thing is telling me 'I'm O.K.'?" I asked myself. It could be telling me to kill my neighbor and worse yet, it could be telling me to plot against the government. "That's it!" I yelled, "enough!" I pulled the plug on Expando-Vision, secure in the knowledge that my subconscious could rest during Johnny Carson's monologue.

See It (or Don't See It) For Yourself

As I said, Expando-Vision may work. The mind is powerful (I know you probably already knew that). If you believe that a message such as "Stop smoking" will really make you stop smoking, it will. I remember a phrase I read in one of those positive thinking handbooks: "Whatever the mind can conceive and believe, it can achieve." It's a little simplistic and cutesy, but it's true.

So I'm not going to tell you whether or not you should buy Expando-Vision. If you wanted to lose weight badly enough to spend $120 on it, I think there's a good chance you will lose the weight. But to reiterate, I didn't feel comfortable using the program and, to be honest, I felt a little foolish sitting there in front of my television trying to trick myself into coping better with stress.

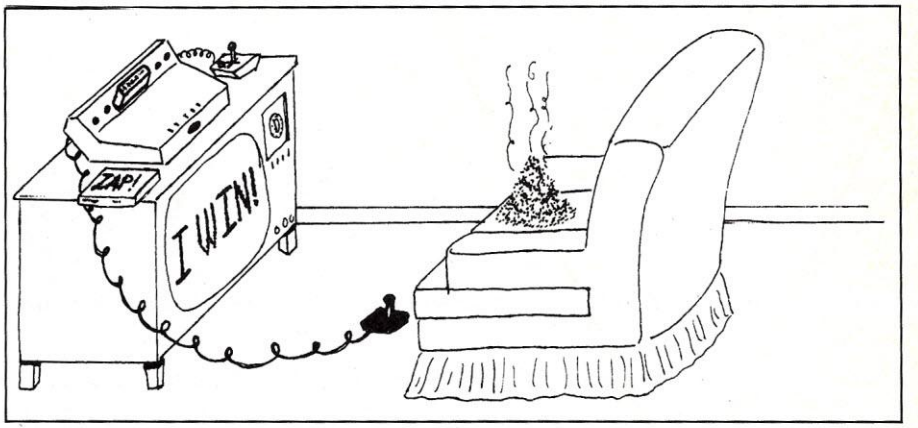
If I really wanted to reduce stress, I'd take a class in yoga; if I wanted to quit smoking, I'd join Smoke Enders or a similar organization; if I wanted to get in better shape, I'd jog or join a health club; if I wanted to improve my golf game, I'd take a few lessons; and if I wanted to improve my sex life, well....■

Expando-Vision: The Vital Facts

System Requirements: Commodore-64, Atari 400 or Atari 800

Manufacturer: Stimutech, Inc., PO Box 2575, Dept. 301 A, E. Lansing, MI 48823.

Price: Electronic Interface Device $89.95, cartridges cost $39.95 each.



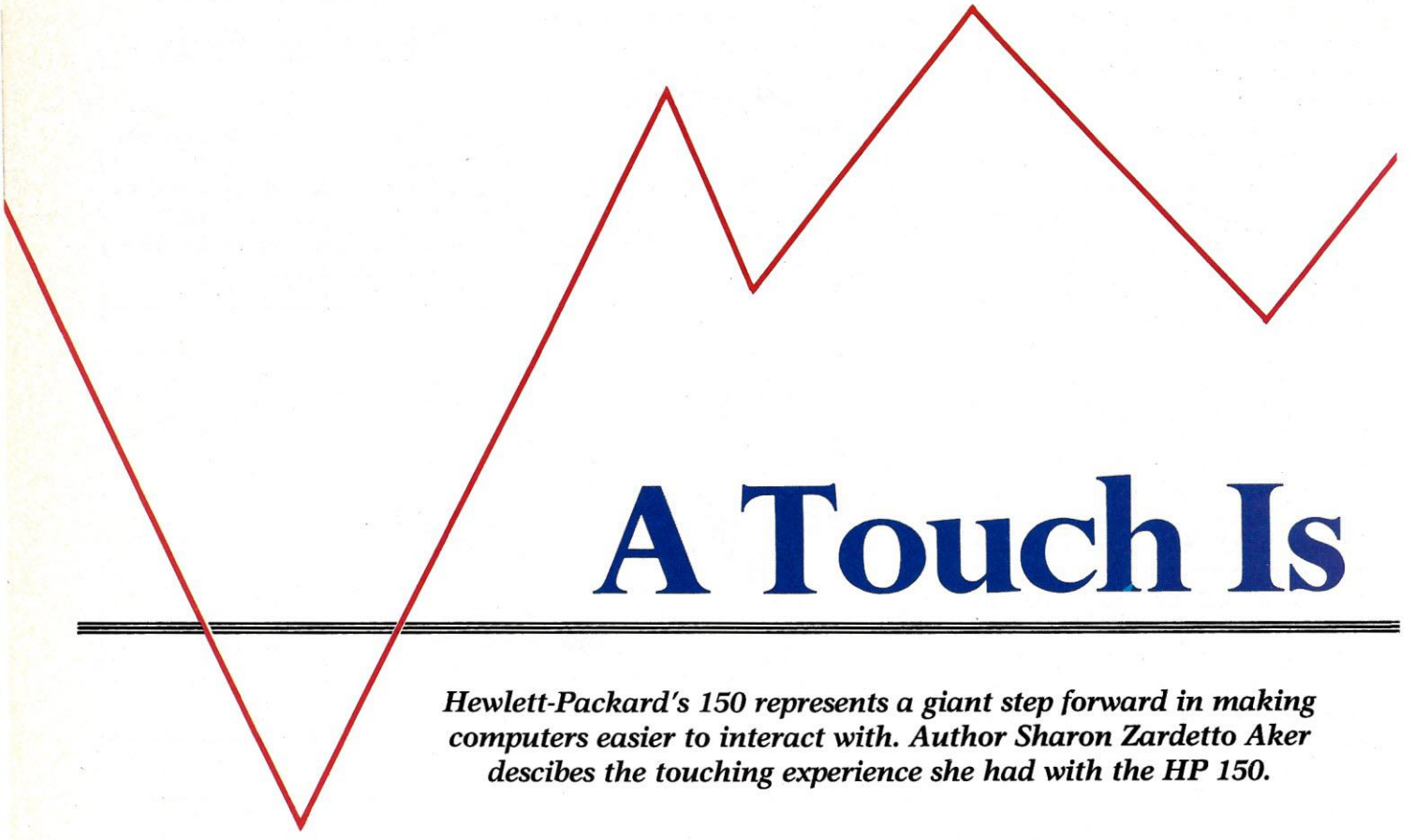


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By Sharon Zardetto Aker



A Touch Is

Hewlett-Packard's 150 represents a giant step forward in making computers easier to interact with. Author Sharon Zardetto Aker descibes the touching experience she had with the HP 150.

Even without its touch screen, the HP 150 is an excellent computer. That the touch screen is standard equipment on a system priced not much higher than a comparably equipped IBM PC may be just the edge that Hewlett-Packard needs to make its entry into the business computer world a success—instant competition for you-know-who.

Footprint

Perhaps the only phrase used more often than "HP Touch" in Hewlett Packard literature on the 150 is "footprint." With an observant eye to the ergonomics of office computing, HP has packaged the 150 to take up barely more than two square feet of desk space. That includes the monitor, processor, keyboard, flexible and Winchester drives and an integral thermal printer.

Not all those items are included in the basic system, of course. What HP refers to as its standard system is basically the HP 150 CPU, the monitor and the keyboard. Also included is an enhanced MS DOS 2.0 operating system, three demo disks, four disk application programs, and various connection cables and instruction manuals.

The HP 150 has two RS-232C ports, an HP IB (IEEE-488) port and two expansion slots; standard memory is 256Kb expandable to 640Kb. This standard system can be used as a terminal; interfacing with the HP 3000 or a mainframe IBM is also possible.

When upgrading to an independent computer, the system can be expanded with single or dual mini- or microdisk drives or any of three Winchester drives: five or 15Mb, with built-in microfloppy back-up drives, or 15Mb without back-up.

The HP 150 can take up to eight drives, giving a total of 120Mb of online storage. Theoretically, the number of drives won't change the size of the footprint, since most are designed to stack under the monitor. Practically speaking, of course, using more than two drive units in the stack will put the screen out of comfortable reaching distance.

The thermal printer—one of seven printers available from HP for the system—is actually user-installed inside the top of the monitor case.

More Figures

The CPU is an Intel 8088, running at 8 MHz, as opposed to the more common sub-5 MHz clocks of other 16-bit computers.

The HP interface bus (HP IB) lets you configure up to 15 peripherals on the one port; the two RS-232C ports (one can serve as an RS-422) can operate, based on user-configuration, from 110 to 19200 bits per second (bps).

Keyboard

If the 150 keyboard is HP's new standard, they are setting a high one. The 107 clearly labeled and well-placed keys are comfortably sculpted. In addition to the standard QWERTY keys, there are dedicated keys for inserting and deleting characters and lines and for clearing a line or the screen.

There are paging keys, Next and PREV, that I assumed would be used under software applications, notably word processing. However, since the 150 keeps two screen pages in memory at all times, the keys will function even when you are working in HP Basic, calling up what has already scrolled off the screen or jumping back to the current page.

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All It Takes

The cursor-control keys are arranged in an inverted T-formation, the downward and horizontal controls in a line and the up cursor and home cursor centered over them. The arrangement is comfortable enough, although not as convenient as a diamond pattern or a full cross configuration might be.

There are eight programmable function keys across the top of the typewriter section of the keyboard; there are four more, unlabeled and mostly unmentioned, at the top of the keypad section. The bare keys are obviously awaiting overlay labels for specific software applications.

The numeric keypad conveniently includes the four basic mathematical functions as well as a decimal point and a comma; it also has its own tab and enter keys. The keypad can also be used as a graphics control pad; you can use the keys to switch alpha and graphics on and off, display and move the graphics cursor and clear the graphics display or send it to the printer.

The Micro-Drive

The HP 9121 dual flexible disk memory was the drive available for review. It sits underneath the monitor, and its design makes the drive and monitor look like a single unit. In use, the drive is louder than I expected, emitting a low grinding noise when the disks are being accessed.

HP's decision to go with Sony's 3½-inch disk is chancy, considering that as yet there is no standard for micro floppies; perhaps HP will help set one. While a big part of the decision had to be that all-important footprint, the micro disks have other advantages as well.

The medium itself may be flexible, but, encased as it is in plastic, it stands up to the less-than-cautious handling that might ruin the larger formats. In addition, the plastic casing allows for the incorporation of a shutter that covers the usually exposed section of the disk when it's not in use. There is also a write-protection clip that slides back and forth so you can easily unprotect it if necessary.

The double-density, single-sided disks store approximately 270Kb in 70 tracks of 16 sectors each. The HP microdrive whirls the disks at 600 rpm. When a disk is nearing the end of its useful life at 1.5 million rotations, the drive light flashes to warn you to make a copy. After a further half-million rotations, the drive will no longer write to the wornout disk.

One for Clarity

The first thing I noticed about the display was its clarity. The nine-inch (diagonal) screen seemed small when I was setting up the system, and I expected to do some squinting when it came to on-screen text. The sharpness of the pale-green lettering against the black background, however, makes for an easy-to-read display. Of no small importance to the overall display quality is the swiftness with which the lettering/graphics fades when the screen is changing.

A later side-by-side screen comparison with a Compaq only confirmed my initial reaction to the HP display clarity and quick fadeout: it's superb.

The graphics resolution is 512 by 390; in addition to the high vertical resolution, those proportions ensure round circles. The alphanumeric display has a resolution of 720 by 328 for 80 columns and 27 lines; each character is seven by ten pixels in a nine by 14 cell. The graphics and alpha displays are in separate memory locations, so although one can be superimposed on the other on the screen, a screen dump of the combined modes is not all that simple.

The bottom of the screen has eight "softkeys," functions available at a touch or by pressing the corresponding function key on the keyboard. The key titles appear in inverse video. The current time is displayed at the bottom center of the screen. (Both time and date are kept current, even when the system is shut off, by an internal battery.)

Of the 27 screen lines, two are used for the softkeys and the last is for system status and error messages, leaving the common 80 column by 24 line format for text. The status messages include such indications as the keypad mode and caps lock on or off.

As I mentioned earlier, the screen memory stores two pages at all times; this allows a lot of vertical scrolling without interrupting the processor.



And, with the text memory separate from the graphics, one can scroll off the screen while the other remains.

Ladies and Gentlemen . . .

Finally, what you've been waiting for—the touch screen.

I was fully prepared to find that the touch screen was a gimmick: something that sounds good, looks good, even works decently enough, but doesn't really enhance the product or its applications to any significant degree. I admit it; for the most part, I was wrong.

The screen is edged with a frame that has light-emitting diodes along the bottom and right, and receptors along the top and left, resulting in beams crossing in a 40 by 23 matrix. The rays are far enough off the screen so that you don't really have to touch the screen at all for your finger position to register.

Depending on the software, sometimes the breaking of the field is enough—touch the appropriate spot and an application will begin. Other times it's the *removal* of your finger that registers; you can place your finger down in one spot, slide it around the screen and pull away when you have made your choice.

When there is a list of choices on the softkeys that are not mutually exclusive, an asterisk appears in the softkey when you turn the function on by touching. It disappears on the next touch. Each touch also elicits a confirming beep from the computer. Another confirming technique, used in most applications, is the enhanced brightness of the inverse video field when you touch the key you want.

For some programs, the softkeys represent main menu choices, and touching one makes submenu titles appear on the keys—a process that can branch down ad infinitum.

The Human Factor

In the words of one of my hardware-oriented friends, HP Touch is very "human-factored." After all, if you want something—point; both my kids knew that before they were a year old. The older one, at four, is especially enamored of the touch screen. He is no stranger to keyboards even at his tender age, but of the six computers currently cluttering the family room, it is the HP that he wants to demonstrate for guests.

My pre-150 idea was that the natural motion of pointing would interrupt the very ingrained motion of working at a keyboard; stopping the typing process to lift a finger to the screen would slow things considerably. Actually, using a function key that is placed out of touch-typing reach is just as much an interruption. I started by using the function keys instead of the on-screen softkeys, but within a short time I preferred the touch choice. It was physically at least as fast and, psychologically, seemed more direct.

If the touch screen usage were limited to the softkeys, the technology wouldn't be much of an improvement over function keys. It is, in fact, the software that makes use of the full touch screen that convinced me that HP Touch was not a gimmick after all.

PAM

Hewlett-Packard chose MS DOS 2.0 as its operating system so that third-party software will be easily transportable to the HP 150. The HP version of MS DOS is enhanced by PAM—the Personal Applications Manager.

PAM basically provides touch menus for the most frequent system commands. I had never used MS DOS, and after a few weeks of working with the 150, I still haven't really used MS DOS. Instead, I used PAM to format disks, create directories, list, copy and delete files and run applications such as WordStar and VisiCalc. It was all done without once checking a reference manual.

Stellar Software Support

Think of a famous name in word procesing packages or spreadsheet programs or databases and, most likely

there is an HP Touch version of it: WordStar, VisiCalc, Lotus 1-2-3, Multiplan and other leading packages.

During the review process, I had a chance to work with WordStar, VisiCalc, the Condor database manager and HP's own Memomaker and Personal Card File. Since I didn't want to turn this into a software review, except to touch on screen enhancements, I enlisted the help of a friend who was familiar with the IBM versions of WordStar and VisiCalc. He brought not only his expertise and opinions but his Compaq for the side-by-side screen comparisons mentioned earlier.

●WordStar: I have to insist, other reviews to the contrary, that WordStar is not particularly enhanced by HP Touch, except perhaps (and that's only a perhaps) for some menu and help choices.

The first obvious problem is that the text is 80 columns, the touch matrix is 40 and your finger is two or three columns wide. Accurate placement of a cursor, given these parameters, is impossible.

I found that you can't even place the cursor in the general area and fine tune it with the cursor keys. Pulling your finger away at any angle other than exactly perpendicular to the screen causes the cursor to slide away from your target as the computer registers your movement.

In addition, you can't see the cursor when it's under your finger—which is where it always is, along with three or four letters of the text, one of which is your target.

Of course, WordStar without HP Touch is still WordStar—a sophisticated, if complicated, word processor. Using the touch screen is optional with this program (as is the case with most third-party software packages), so while nothing is added to WordStar, neither is anything lost.

●MemoMaker: HP has its own word processor for the occasional writer. While it is a very nice program with more features than the title may suggest, its use of the touch feature was limited in much the same way as WordStar's.

Touching for block moves is easy enough and relatively accurate. If the entire block is not on the screen, however, much of the simplicity is lost. Setting margins by touch is a nice idea, but horizontal accuracy is too difficult to make it a practical idea.

The program itself, without touch options, is still terrific. I was able to do most of what I wanted to without even referring to a manual.

●VisiCalc: I expected to be as disappointed in VisiCalc as in WordStar, but HP Touch did, in fact, add a little something to the program.

Spreadsheet columns are easier to pinpoint with a fingertip than are single letters; rows, being half again the size of a column, were not that much of a problem even in WordStar. Accurately placing the cursor in a specific on-screen cell took little practice, and when the target cell was quite a distance from the current one, pointing was faster than moving the cursor through all the intermediate cells.

My VisiCalc pro was less impressed than I was at this enhancement; that is perhaps indicative of the general difference between the experienced user and the novice. For someone used to VisiCalc, the usual procedures will from familiarity be easier than touching. (Of course, the novice is HP's primary target.)

Visicalc with HP Touch is at its best when data has been entered and various manipulations are available strictly through screen menus and touch cursor control. This eliminates the need for switching from keyboard to screen and back again.

Series 100 VisiCalc (the prefix series 100 is HP's term for all its touch-enhanced software) also has extensive help menus that were not on the IBM PC version that my friend uses.

Personal Card File really makes the HP Touch shine. It proves the touch option *can* be an alternative to the keyboard.

●Personal Card File: This is a program where HP Touch shines; it is the one that proved to me that the touch option can be an alternative to the keyboard, not just an ancillary input device.

PCF is basically an electronic rolodex. While you can use touch menus to set up your files, it is nearly as convenient to use the keyboard. Once your files are set up, however, you can unplug the keyboard and still use PCF to its fullest.

Touch the wheels at the side of the screen and the cards flip by. Touch the tab of one of the visible cards and the record appears on screen. Touch a field and an appropriate softkey, and other records with corresponding field values will be compiled into

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Fig. 1. Cost of HP 150 system and peripherals.

another on-screen rolodex. With the right peripherals, you can point to the telephone number and the computer will go right ahead and dial the number for you.

● Condor: In brief, the two series 100 Condor database managers have, in regard to the touch enhancements, some of the disadvantages of WordStar and most of the advantages of PCF.

Semi-Integration

"Fully integrated" seems to be the latest computer buzzword. HP's 100 series programs are not fully integrated, but data can be traded among many of them. A MemoMaker letter can be transferred to WordStar; Condor and VisiCalc data can be put into HP's graphics handler; Condor and PCF records can go into Mailmerge and so on.

HP Basic

The Basic language available in such a computer is not of paramount importance, since most users will be running programs on it, not writing them. Personally, however, I like a computer not just for what it can do, but for what I can make it do myself.

HP Basic, a Microsoft progeny, is heavy on math and string functions, practically overdosed with I/O commands and easy to understand. The Print Using command for formatting output is particularly useful if confusing to work with at first. The instruction manual is only a guide to available commands, not a tutorial in Basic programming.

For all the power of the 150 and the flexibility of its Basic, actual programming is hampered by two factors. Spaces are needed everywhere to avoid syntax errors: "1TO5" in a for...next loop will not work. The real surprise, however, is the absence of automatic on-screen editing; you have to switch to a special edit mode to change any program line. HP Basic is frustrating to work with, but that will hardly be a consideration for a potential buyer.

Other languages soon to be available are C, Pascal, Fortran and Forth.

The Best Peripheral

Hewlett-Packard is sparing no expense in its presentation of the HP 150. After establishing a reputation for fine computers for the scientific community, it is trying to crack open the business market with a system that is, if not of revolutionary proportions, at least of significant importance. It is actively encouraging third-party software development and continuing with its own. As more software is designed around HP Touch (as opposed to transported from another system), the benefits of a touch screen are bound to become more apparent.

HP is also making available the most important peripheral of all: support. Every software package is prefaced with a toll-free number for questions and problems. Classes are to be conducted by Hewlett-Packard and its dealers. There is a series 100 Communicator magazine to keep users up-to-date and even a number for finding out where you can see an HP 150 demo (800-FOR-HPPC).

HP Touch is more than an gimmick; whether it is the start of a trend remains to be seen. Still, the HP 150 is excellent even without the touch screen. With the touch screen, it is really something special.■

I would like to thank Arman Tookmanian for his assistance in the preparation of this review.

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Good-bye Silicon, Hello Superchip

TEGFET (a two-dimensional electron gas field-effect transistor) is a revolutionary chip that may relegate your Apple or IBM to the bottom shelf of your closet.

By Kent Patterson

Unless you've spent the last few years in a monastery or bunkered out in your basement waiting for Soviet ICBMs, you've heard a "revolutionary" new computer announcement almost every three weeks. Usually it's nothing more exciting than maybe 2Kb more memory or a new color-coordinated control button.

However, a revolutionary new chip is coming that just may make that shiny new Apple or IBM look as quaintly antique as a wind-up phonograph. It's called a high electron mobility transistor (HEMT). A more descriptive name is a two-dimensional electron gas field-effect transistor (TEGFET to its friends).

It may do to the silicon computer chips of the 80s exactly what the silicon chip did to the soldered breadboards of the 60s.

The Wizards of the Microworld

The concept of the TEGFET dates back to 1970 when Leo Esaki and Ray Tau of IBM did some theoretical studies. The hardware necessary to make actual devices simply was not available at that time.

My introduction to the TEGFET concept came from Jeff Harrang and Randy Goodall, University of Oregon doctoral candidates in physics.

With the guidance of Professor Richard Higgins (currently on leave), Harrang and Goodall are probing the world of a two-dimensional electron gas.

As physicists, Harrang and Goodall are interested more in measuring electron mobility than in making new computer chips, but such basic research creates the foundation for the microprocessors of the future.

MOSFET vs TEGFET

If you could open the case of your home computer and crack open its chips (don't do this unless you are *very* tired of your computer), you'd find each chip contains thousands of tiny metal oxide semiconductor field-effect transistors (MOSFET).

Not everything in there is a transistor, of course, and transistors come in more kinds than could be listed here. But whatever their type, most modern transistors depend on similar technology. They are constructed like a microscopic open-faced sandwich. On the bottom (the bread part) is a chip of highly purified silicon sliced from a single crystal.

On top of the silicon are layers of "doped" silicon. Doping is the addition of minute quantities of a material, which will serve as a donor (a source of electrons) or an acceptor and pick up electrons. Thin layers of silicon dioxide, a substance closely related to glass and sand, have different electrical properties and can be used to help direct the flow of electrons.

Designers can direct the flow of electrons by carefully controlling the amount and kind of doping and the placement of the silicon dioxide. The transistor can be made to amplify signals or to serve as part of a logic circuit, which is the thing needed to balance your checkbook or to produce Space Invaders.

The Truth About Silicon

The good news about silicon is that it works and there's plenty of it; beach sand is mostly silicon. This technology has been around long enough to be reliable and cheap. But from the standpoint of the electrical engineer, silicon just isn't a perfect ten.

First, it's slow. Physicists have long known that faster semiconductors can be made from what chemists call the III-V group of elements on the periodic chart. A substance like gallium

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arsenide may offer speeds as much as three to seven times greater than the silicon chip.

Secondly, the doping of the silicon disturbs the order of atoms in the crystal. The atoms of the doping substances are of different sizes than silicon. It's like trying to pack baseballs and basketballs into the same box.

A good way to speed up electron flow is to cool the conductor, but with the disordered atoms of silicon, this drastic step is not as effective as it might be. "You can think of it as the equivalent of a bumper pinball game," says Harrang, with the balls being the electrons and the bumpers being the atoms. "If the bumpers are all over the place, it's bump, bump, bump." He waves his hand about. "But if the bumpers were in neat rows, then wooosh!" He drops his hand in one quick swoop.

The more the electrons collide, the longer it takes for them to get through the transistor. Electrons in a silicon chip behave like a not very bright bull running through a forest of red trees.

All that bouncing around wastes time and energy, but there's a worse problem. Much worse. Along the interface where the layers of doped silicon meet the layers of silicon dioxide, there's the subatomic equivalent of a Los Angeles freeway interchange.

Because the interfacing materials have different atomic characteristics, the electrons must "change lanes." They find that some lanes don't even have exits. "If you looked at the interface at the atomic level," Goodall says, "you'd see all these silicon dioxide bonds sticking down. There's silicon down here, and they don't all line up. Some bonds are unsatisfied. There's a woeful electron here because nothing's attached to him." Since unsatisfied bonds scatter the electron flow, woeful electrons lead to woeful computer designers.

Superchip to the Rescue

Like a MOSFET, a TEGFET is a sandwich of semiconducting material, but here the resemblance ends. On a chip of gallium arsenide (one of the III-V substances), a technique called "molecular beam epitaxy" uses a beam spray to grow crystals of gallium arsenide, almost literally one layer of atoms at a time. A layer with an upper limit of ten billionths of a meter thick contains ten to 100 atoms. This technique can give unprecedented purity. On top of this is a layer of gallium arsenide mixed with aluminum.

It would take a clearer crystal ball than mine to predict the future..., but some visionaries say future computers may even think.

That's quite a sandwich. If you're thinking that the super thin layer reminds you of the roast beef at the company cafeteria, it's millions of times thinner than that. It's a two-dimensional world nearly as thin as your shadow on the wall.

In order to further speed electron flow, the entire device is cooled with liquid helium to a temperature only one degree above absolute zero, some 459 degrees Fahrenheit below zero. At that temperature, molecular motion ceases. The vibrating atoms are lined up as perfectly as soldiers on parade, and electrons can speed between them.

Even better, the interfacing problems between layers disappear. "The aluminum doesn't change the size of the spacing," says Goodall. "This interface is called 'lattice-matched.' The two lattices match perfectly."

In fact, the electrons don't need to flow through doped areas at all. In the TEGFET, the doped layer serves only as a pool of electrons. Since pure gallium arsenide has greater affinity for electrons than the doped material, the doped area does little more than supply electrons. Pushed along by a voltage applied from outside, the electrons form what Harrang calls a "sheet"—a single two-dimensional layer. The sheet flows only through the undoped area, the perfect crystal.

"These two effects together—a perfect interface and no doping materials in the current path—give the speed," says Harrang.

Faster Than a Speeding Bullet, More Powerful...

In theory, TEGFET technology may provide transistors that will work up to 200 times faster than conventional silicon transistors. That's not the entire story, of course. Much research still needs to be done. Then the engineers and industrial people will have to find ways of mass-producing TEGFET-integrated circuits and microprocessors. New computers will have to be designed to exploit such speeds. As many computer users have discovered, having a superfast microprocesor won't help if you have superslow software.

Like the TEGFET itself, the supercomputers aren't likely to be at your local Byte Bar for some time. How long it will take is anybody's guess: perhaps five or ten years. There are rival technologies that are advancing rapidly. For the moment, TEGFET looks promising, but it's very much a horse race. Anyone who can predict the winner will knock them dead on Wall Street.

When such speeds do become available, they will revolutionize the use of the computer. Incorrect electric bills can be printed faster and Space Invaders will be nastier and speedier than ever.

In computers, speed equals power. Faster computers can do not only the same old things in less time, but they can do things that today's computers cannot do.

It would take a clearer crystal ball than mine to predict the future. New technology tends to suggest its own new uses. Certainly Charles Babbage, the early nineteenth century gentleman who first suggested an "analytical engine"—to be made of rods and gears—could never have predicted VisiCalc or Donkey Kong.

Higher processor speeds would revolutionize graphics. Anyone familiar with the blocky, slow-moving graphics of a few years ago will agree that great progress has been made. However, computers haven't yet achieved the quality of fine photography—or even Uncle Fred's Super 8 snapshots of the Rose Bowl. Even with machine language programming, computer animation isn't up to Daffy Duck.

Very high speed microprocessors could change this. Graphics could show us real time problems, like how a drive shaft snaps or a nuclear plant comes to grief. Super high-speed computers may make fully accurate mathematical predictions of weather patterns or play better chess than Bobby Fischer.

Some visionaries say future computers may even think.■

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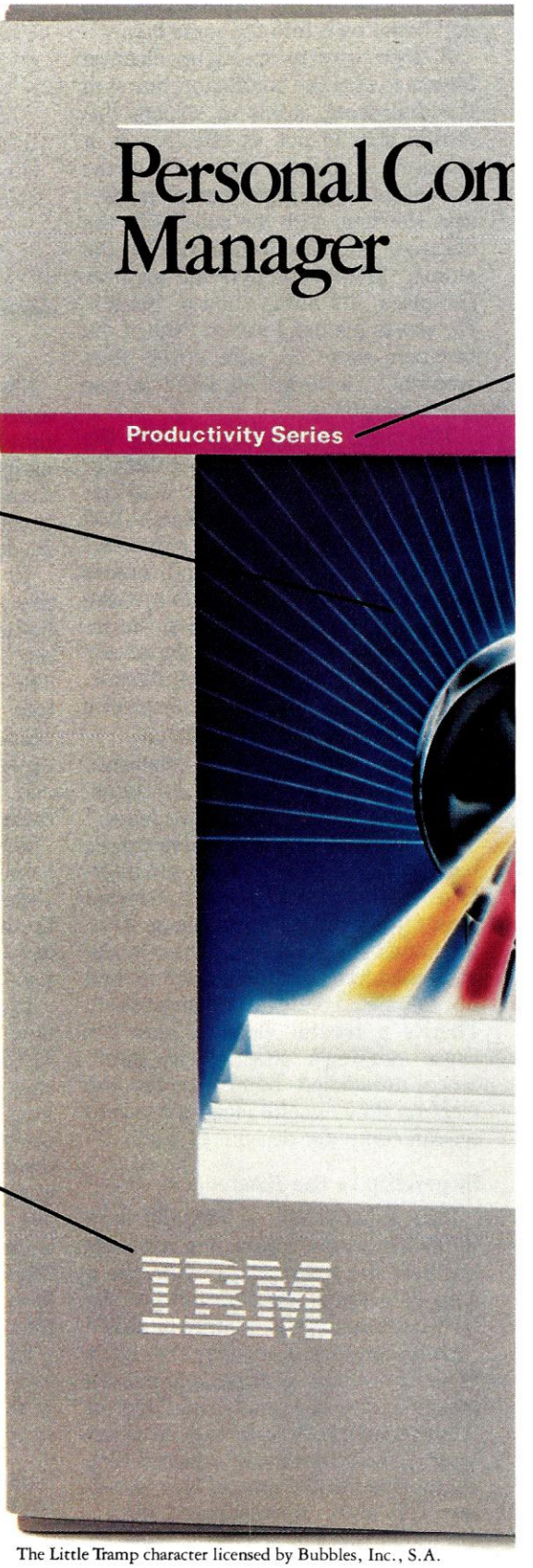
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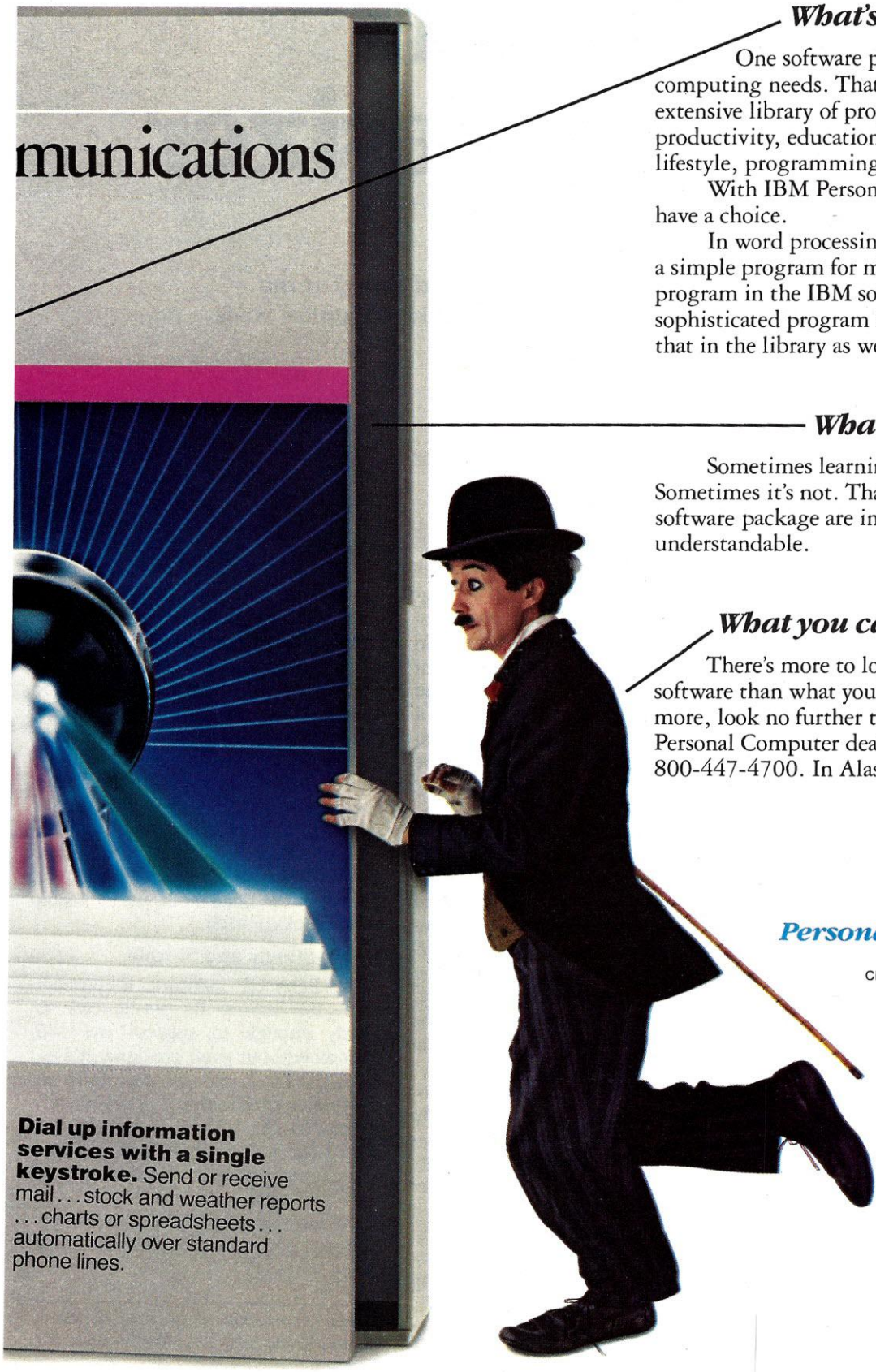
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The Echo Voice Synthesizer

Technical Editor Jim Heid takes a look (and listen) at the Echo GP—an interesting device that can be either a human voice or phoneme synthesizer.

By Jim Heid
Microcomputing Technical Editor

To many people, the phrase "computer speech" brings up images of *2001: A Space Odyssey*'s HAL 9000, a computer that conversed freely with the humans it plotted to kill. Although your micro can't sing *Daisy* with the same flair that HAL does (at least not yet), it can perform some pretty remarkable speech feats using a speech synthesizer, a device that, attached to one of your computer's input/output ports, gives your micro the power of speech.

Basically, two types of speech devices are available. One contains a fixed vocabulary of words that were spoken by a human, then digitized (converted into ones and zeros) and put into the synthesizer's ROM. Probably the most well-known example of this kind of device is Texas Instrument's Speak 'n' Spell toy. Those telephone company announcements that tell you a number has been changed are done with similar devices. Since the "voice" is a human voice that's been recorded, the speech generated by this type of synthesizer is clear and easy to understand. However, these devices have one large disadvantage: They know only a fixed number of words. If your application requires words that the synthesizer doesn't know, you're out of luck.

The other type of speech synthesizer doesn't have a programmed vocabulary. Instead of knowing whole words, it knows only phonemes (pronounced FOE-neemes), which are the smallest discernible sound units of a language. The word "speech," for example, contains four phonemes: the "s" sound, the "p" sound, the long "e" sound and the "ch" sound.

Since phoneme synthesizers know only units of speech rather than whole words, it's your job to put the phonemes together into meaningful words. Programming a phoneme synthesizer is, therefore, much more difficult, but the advantage is that you aren't restricted to a fixed vocabulary. Properly programmed, a phoneme synthesizer can talk about astrophysics as easily as it can count to ten.

There's another drawback to phoneme synthesizers. Since the quality of speech depends on the programming job, they're generally not as easy to understand as human voice synthesizers. You have to concentrate on what's being said to understand it; in fact, it often helps to know in advance what the synthesizer is attempting to say!

Enter the Echo

The Echo GP from Street Electronics provides an interesting compromise between the clear but limited human voice synthesizer and the versatile but hard-to-program phoneme synthesizer. It contains a text-to-speech conversion program that takes plain text (no phoneme data), converts it to its phoneme equivalents and then says it. According to the manual, the conversion program uses almost 400 rules and a list of exceptions. You can also program the Echo using phonemes. Before taking a closer look (or listen?) at the Echo's output, let's look at the package itself.

Small, Sturdy and Simple

The Echo GP measures a compact 4×5×1½ inches. Its plastic case is sturdy enough to support my 145 pounds without even creaking (it's always good to know you can stand on your voice synthesizer if you have to). I dropped the unit four feet onto a hard floor a few times and it never complained. In short, it seems to be a well-built little device.

Hooking up the synthesizer is easy. The unit comes with a four-foot cable

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that has a five-pin DIN connector on one end and a male DB-25 on the other. The DIN connector plugs into the back of the Echo, and the DB-25 into your computer's RS-232C port. (If your computer's serial port doesn't have a female DB-25, or if its port is wired as DTE, you'll have to wire your own cable. The manual contains an appendix showing the pin configurations of the Echo.) Finally, you plug the supplied ac adapter in, and insert the miniature phono plug into the power jack on the Echo.

Here's where the Echo's biggest fault shows up. The unit has an external speaker jack that's also a miniature phono jack. Worse yet, the two identical jacks aren't even labeled. Although I didn't try it, it's a safe guess that plugging the adapter into the external speaker jack will silence the Echo for good. You should never, never be able to attach a power source anywhere except where it's supposed to go.

Once the unit is properly connected, you have to make sure that it and your computer are communicating at the same speed and protocol. The bit rate that Echo uses is adjustable between 75 and 9600 bits per second with one start bit, eight data bits, one stop bit and no parity. You can choose either an RTS/DTR or XON/XOFF protocol. Four small switches on the unit's underside determine speed and protocol, and the manual contains an appendix listing the correct switch settings for the Atari 850, the TRS-80 Color Computer, the TRS-80 Models I and III and the Heath/Zenith 100 series (I used a Heath H120).



The Echo GP speech synthesizer.

Command	Result
C	Compressed mode (fast speech)
L	Letter mode (Echo spells each word letter by letter)
W	Word mode (Echo pronounces each word)
K	Capitals mode (Echo pronounces whole words sent in lowercase, but spells groups of capital letters individually)
N	No-caps mode (disables capitals mode)
A	All punctuation mode (Echo pronounces all punctuation characters)
S	Some punctuation mode (Echo pronounces only some punctuation characters. Commas, periods, colons and so on are not pronounced)
P	Pitch adjust (lets you change the voice's pitch)
F	Flat pitch mode (no intonation in voice)
V	Volume adjust (lets you change the voice's loudness)

Table 1. Echo GP Speech Synthesizer commands available in the text-to-speech mode. The command letter must be preceded by a Control-E (for Echo) sequence.

Using the Echo

When you turn it on, Echo greets you by saying "Echo ready." From then on, it says anything that you send through your serial port. Since many computer's serial ports are used for line printers, this means that you can send text and commands to Echo using Basic LPrint statements or using any program that supports printer output. Echo has a 1776-byte text buffer; to keep from losing text when the buffer is full, the unit sends an XOFF code or sets its status lines to busy, depending on how you configure it.

In its standard text-to-speech mode, Echo converts whatever you send it to phoneme equivalents using its built-in text-to-speech conversion program and then says it. Echo's default setting includes a degree of inflection; if you end a sentence with a question mark or semicolon, the voice's pitch rises slightly. If you want a flat, monotone voice, you simply send a Control-F code. That switches the unit into its flat-pitch mode. You can change other characteristics of the voice, including overall pitch, volume and whether punctuation characters are spoken, using similar commands, listed in Table 1.

Echo's text-to-speech mode works fairly well. You do have to misspell some words for them to be pronounced properly though. For example, "typewriter" comes out sounding like "tipwriter" unless you put a space between "type" and "writer." Similarly, "robot" should be spelled "rowbot," "program" as "pro gram," and "biscuit" as "biskit." You get much better results when you spell words phonetically.

Unfortunately, that means that you won't get very good results when you send Echo straight text. I was hoping to use the unit to read articles out loud, but I had trouble understanding it most of the time, even when I read

the text as it was being spoken. It's a shame, too; true text-to-speech capability would be a great asset for writers and a godsend for the blind.

As mentioned earlier, you can also program Echo using phonemes. Although this programming method is complex and requires practice and patience, you can get some good results using it. The phoneme mode lets you control the voice's volume, inflection and pitch to a greater degree than the text-to-speech mode.

To control the voice characteristics, you use a collection of special characters. Assume, for example, you wanted Echo to say "no" rather emphatically. You'd program N<OO. The less-than sign causes the voice's pitch to drop. Similarly, if you wanted Echo to ask "no?" you'd program N>OO; the greater-than sign causes the pitch to rise. Other voice-control characters let you place emphasis on certain phonemes and change the voice's volume.

The phoneme mode provides more control over the voice than the text-to-speech mode and, once you get good at it, you can get more understandable speech.

Documentation

The Echo GP comes with a 45-page manual and a phonemes reference card. The manual is clearly written but not very well organized. For example, the chapter on installation, located at the beginning of the manual, refers you to an appendix in the rear for instructions on setting the bit rate and protocol. Why not just put those instructions at the beginning of the manual, along with the other installation instructions?

The manual also contains an error in its instructions for setting Echo's switches for use with a Heath/Zenith computer. It tells you to set switch 1 on, and switches 2, 3 and 4 off for 4800 bps, RTS/DTR communication. The correct setting is switch 1 off, and 2, 3 and 4 on.

The manual contains several sample Basic programs that you can use to send text and commands to the Echo. Programs are provided for the Atari 400 and 800, the Apple II and III and the TRS-80 Color Computer. That brings up a strange point: there are sections on using Echo with a Heath/Zenith 100 and a TRS-80 Model I or III, but there are no sample programs for those computers.

It's safe to say that Echo's manual will not win any documentation awards. The information you need to use Echo is there, however; you just have to root around to find it.

Closing Words

The Echo GP does not represent a significant stride forward in speech synthesizers. It suffers from the same problem that most synthesizers do: mediocre speech quality. You simply can't always understand the thing. The text-to-speech conversion program works pretty well, but because you have to spell many words phonetically to make them understandable, it's not suitable for reading straight text files, nor would I recommend it for use with the blind. The phoneme mode provides better control over the voice and more accurate speech, but only if you work at it.

The Echo GP is, however, well-made and, at $199, reasonably priced. If you're interested in learning about speech synthesis, it's a good way to get your feet (or ears?) wet without spending a lot of money.■

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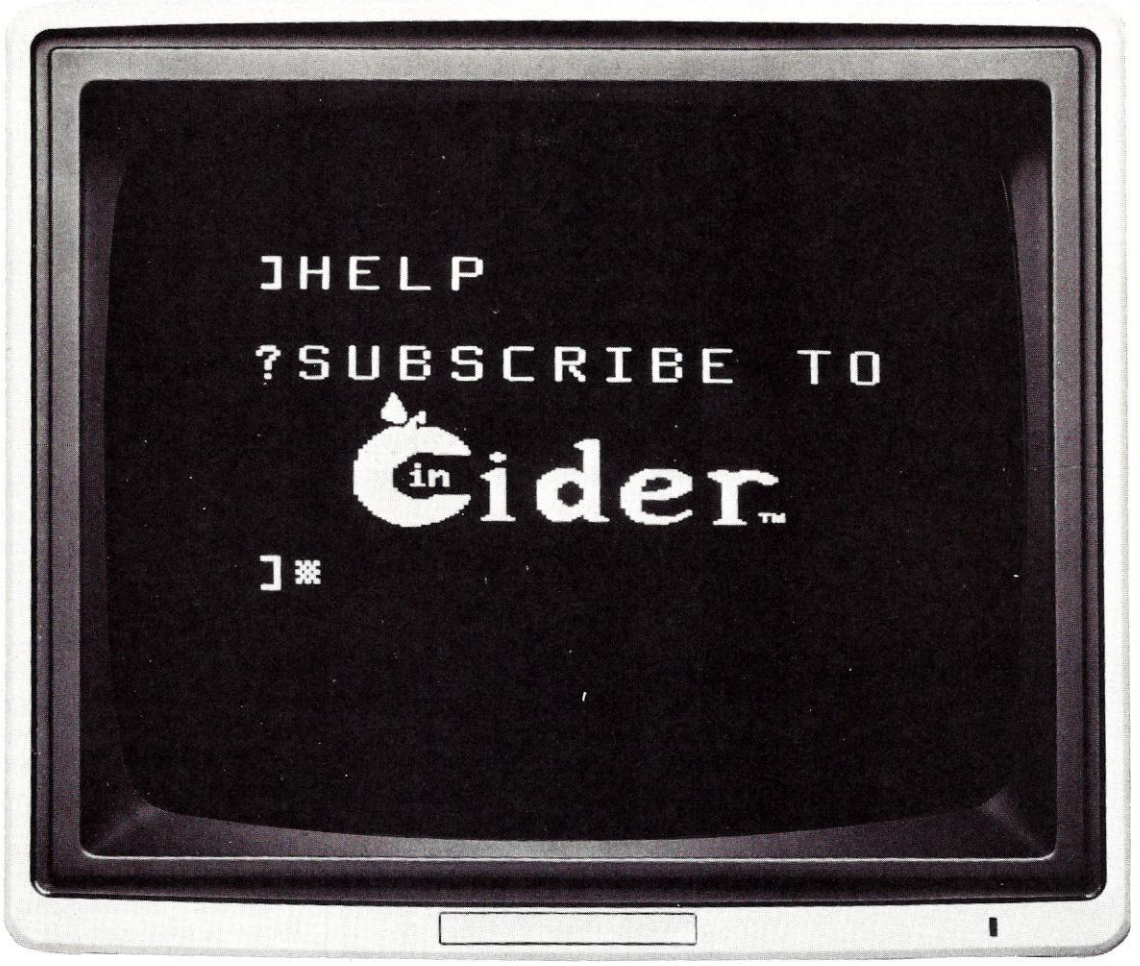


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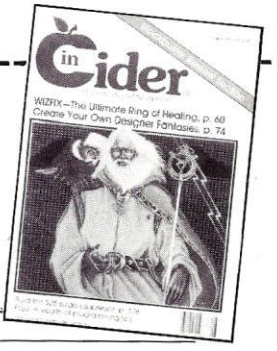
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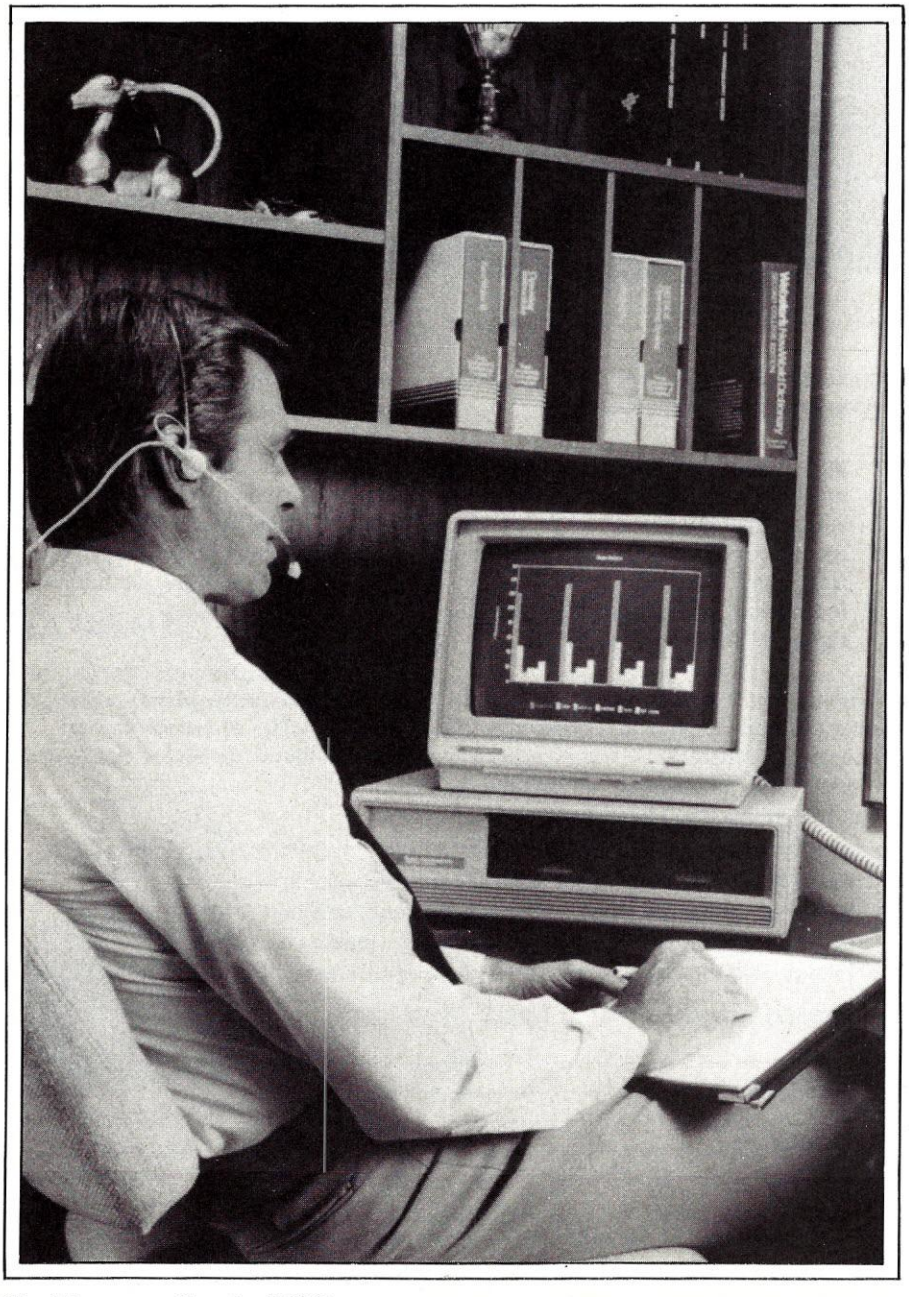
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Computers Reach For Speech

In this article, we explore the realm of voice recognition and speech synthesis. With technology advancing in leaps and bounds, you and your micro will be enjoying the lively art of conversation in no time.

By R.J. Dunne



With ears for microphones, human beings are easily accomplished speech recognizers. This ability begins in infancy before you are even able to speak yourself. You learn to understand the words of your closest relatives, those of your friends and even those of strangers, as long as they use a common language.

Speech understanding for a computer is tremendously more difficult. In fact, natural language speech understanding by computer, for either a powerful mainframe or a desktop micro, is still in the future. However, speech recognition of a limited vocabulary within a specific, clearly defined domain is currently possible.

People communicate with each other in natural languages. These were not invented in a scientist's laboratory but, rather, were developed gradually in order to articulate needs and thoughts. The process is on-going. Natural languages are informal and full of ambiguity, as are human beings.

Artificial languages, on the other hand, like musical notation, Basic and Pascal, are created and defined by specialists. They are formal, precise and work well in their limited context.

Natural language speech understanding for a computer remains a long-range goal. More restricted speech understanding has been accomplished in several research labs, and many isolated word speech recognizers are on the market.

While speech is your most spontaneous form of communication, a

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digital machine doesn't experience the world in the same direct way you do. Your experiences, your ideas, even your work are in the analog realm—loaded with subtlety and shades of gray. Your brain processes what you experience in a parallel fashion, accepting many pieces of information simultaneously.

So far, computers function in a more linear, serial way. True speech understanding may have to wait until a new generation of parallel-processing computers is developed.

Speech recognition of individual words or of simple, short phrases requires a different approach than speech understanding does. Recognition focuses primarily on identifying words based on sounds and their acoustic signals, while speech understanding places more emphasis on analyzing whole sentences through attention to grammar and meaning.

The process of learning language is now viewed as demanding a large amount of specialized knowledge, not just a series of rules. Eventually, the way computer speech understanding is accomplished will be similar to what artificial intelligence researchers term expert systems.

Speech recognition (SR) and speech understanding research have gone on for more than 30 years. Some problems have been solved, while others continue to occupy the world's academic and industrial laboratories. Current research involves linguists and psychologists as well as computer scientists.

The primary gains since the 1950s are in the complexities of tasks SR systems can handle. In 1952, Bell Labs was proud to develop a system that recognized the digits zero through nine.

Today the vocabulary understood by commercially available SR systems varies from ten to several hundred words. In the lab, using larger computers, vocabularies number in the thousands.

Greater capabilities now allow disabled people to operate various mechanical devices and achieve mobility with voice commands alone. Pilots can direct certain computer functions with verbal instructions. The list of practical applications grows daily.

How a Computer Recognizes Speech

When you speak, the vibration of your vocal tract creates disturbances in the surrounding air. All SR systems require some type of microphone to function. The sound waves created by your voice are converted to an analog electrical signal when picked up by the mike.

The computer then uses an analog-to-digital (A-D) converter to digitize the voice information received. An A-D converter is generally part of the SR hardware.

Sound waves are three-dimensional. In order to be stored in the computer's memory, their mathematical description must be a two-dimensional translation of the original waveform. When the data stored is that of the sound wave itself, this information is called a template.

Template-matching is the most popular approach to accomplishing recognition. Since most SR systems are speaker-dependent, reference templates must first be created. You must speak each word of the available vocabulary. This teaches the computer your voice. The larger the vocabulary, the more memory required. Whenever you vocalize a word, the reference templates are accessed and compared. When a match is found, the computer carries out the identified command.

One recent innovation, Linear Predictive Coding (LPC), is a system of mathematical analysis that enables the computer to use fewer numbers when storing template information. Certain mathematical coefficients can be stored instead of numbers describing the entire wave.

When the template is needed, these coefficients predict the remaining numbers to reconstitute the entire waveform. LPC makes substantial memory savings possible. LPC is popular in speech synthesizers as well; for example, Texas Instruments uses LPC in its best-selling learning toy, Speak 'n' Spell.

Another method, favored by some linguists, is called features-analysis. Information describing a sound's phonetic features is stored instead of data on the sound's actual waveform. Fig. 1 gives examples of features-analysis.

Computers like the HAL 9000 of *2001: A Space Odyssey* and KITT of television's *Knight Rider* understand human speech. They not only recognize the individual words but understand syntax and semantics. Of course, these two computers are Hollywood fantasies. What almost all commercially available SR computer systems do today is more accurately called word verification.

The computer contains a reference list composed of key command-type words or phrases. If the application is word processing, for example, some of the words used may be: print, delete, move and copy.

When you speak one of these stored words, the computer verifies that this word matches one on its reference list. Several available products let you define one spoken word as the equivalent of many keystrokes (as many as 50).

How Speech Recognition And Speech Synthesis Differ

Perhaps you've been in an elevator that literally "tells" its occupants what floor it's on. Or maybe you've had a ride in a car that verbally warns the driver when the oil is low or a door is open. The voices you hear sound human.

Speech synthesis, also known as computer generated speech, is used for many practical purposes today. A single chip containing the 40 phonemes that construct all English words generates the sounds.

Much speech synthesis is clearly defined and precise. However, voice intonation is still not always appropriate or realistic. Without knowing semantics, a computer can't decide which words to emphasize in a sentence or where to raise or lower its voice. Programmers find it difficult to completely formalize the rules on how to do this.

Sound	Vocal Cord Vibration?	Place of Articulation	Nasal?
p	no	low	no
t	no	high	no
k	no	mid	no
m	yes	none	yes
n	yes	none	yes
a	yes	none	no

Fig. 1. Examples of features-analysis, courtesy of Professor Peter Ladefoged, professor of phonetics, UCLA.

Speech recognition involves a different but perhaps related set of complications. First, recognition is anything but precise. The human voice is a most inconsistent transmitter. Emotion completely changes the way you speak. If you're tired, the same words come out slower or lower. If you're excited or angry, you speak faster or slur your words more.

These alterations are enough to make computer comprehension difficult. Imagine a computer trying to understand different speakers saying the same words but with different regional accents! Other problems include microphone variability and distracting environmental noise.

Both speech recognition and synthesis systems face larger long-range problems; so far, computers can't understand natural language.

Major Recognition Obstacles

Two major problems are at the heart of current research. Speaker-dependent systems are very restrictive. Each time a different speaker wishes to use a particular SR system, he or she must retrain the computer, a slow and time-consuming process. The few speaker-independent devices available are generally less accurate and include a smaller vocabulary.

The biggest problem is lack of accurate continuous speech understanding. A few laboratories, using large mainframes, have shown significant but limited results. Because of the tremendous computational power required, only mainframes are capable of anything approaching real-time processing.

As memory chip size and expense continues to decrease, more mainframe results will be transferred to minis and micros. Current laboratory results are, however, still far from natural language speech understanding, except for specific, task-oriented systems.

Another issue under investigation is background noise distraction. While use of close-talking, noise-cancelling microphones improves computer performance, total elimination of interference remains a goal.

What's Available?

A number of SR systems are on the market for use with microcomputers. Some are plug-in boards with accessories (like a microphone and utility software) and others are stand-alone units that connect to a micro, usually through a standard RS-232C serial port.

The human voice is a most inconsistent transmitter. Emotion completely changes the way you speak.

They all tend to be quite expensive, often doubling the cost of the computer. Most also need to be custom designed for use with available software.

I'd like to explore some SR systems currently available and offer a general description of their characteristics. Each manufacturer can provide more extensive information and specifications. Contact companies directly if you desire more complete information. In my experience, local retail dealers know very little about SR products.

The just-released Speech Command System (SCS) for Texas Instruments' Professional Computer is one of the newest SR systems for a micro and the only one actually made by the computer manufacturer. It includes a speech synthesizer and telephone management system as well as recognition capabilities.

At the heart of TI's SCS is a new 32-bit, high-speed microprocessor chip, TI's own TMS320. The processor uses high-density information compression and linear predictive coding for substantial memory savings. The SCS understands up to 50 words or short phrases at a time with more than 99 percent accuracy. The SCS spots keywords (you don't have to pause between each word spoken) and picks out the understood command word from within a longer word string.

A microphone comes with the system. TI recommends that you initially repeat each command three times to enable the computer to average out differences in how you speak.

The TI Professional uses MS DOS, and many popular business application packages have modified versions able to interact with SCS. The Speech Command System lists for $2600. (See the review elsewhere in this issue.)

Waldo is a speech recognition board made by Artra of Arlington, VA. It is available in versions for the Apple and Heathkit (Zenith) Z89 computers and comes with a disk, called Housemaster, for verbally controlling household devices.

Waldo recognizes 24 command phrases with 90 to 95 percent accuracy as well as 32 time-driven commands. Also included is a clock/calendar with battery backup, two programmable sound generators and a stereo amplifier. An ultrasonic home-controller driver connects to the board with a single removable plug. Waldo's list price is $599.

Interstate Electronics of Anaheim, CA, one of the oldest companies making speech recognition products, offers a variety of them. One system is the SYS300, which is compatible with many micros and terminals having a standard RS-232C port. SYS300 is speaker-dependent, contains a 200-word vocabulary and achieves 99 percent accuracy.

Interstate also makes two chip sets that are sold to manufacturers who then use them as the building blocks for their own speech recognition products.

The first of Interstate's chip sets is VRC100-2, which consists of two NMOS chips. In a speaker-dependent environment, they can recognize as many as 100 words or phrases, 200 words if additional memory is used. The VTC100-2 uses an on-board 16-channel spectrum analyzer to analyze speech input.

This chip set is currently used in several products, including a plug-in board for the IBM by Tecmar, two for Apple by Voice Machine Communications and a keyboard add-on board for the IBM made by Keytronics.

Interstate has another chip, the VRC008, designed primarily for toy, game and small appliance manufacturers. It is speaker-independent with only a five- or six-word vocabulary. It has 90 percent accuracy for a general population. Sanyo is test marketing a new toy which uses the 28-pin chip. Several companies are investigating possible future uses of VRC008.

Voice Machine Communications (VMC) of Santa Ana, CA has two plug-in boards for Apple and Apple-compatible computers. Both use Interstate Electronics SR chips that were designed in part by VMC President Ronald Runge while a branch manager at Interstate.

VMC's first product, IntroVoice-1, which has been on the market about a year, works with Franklin, Basis and Syscom computers as well as the Apple II Plus and the IIe. This board and the editing software that comes with it let you verbally interact with most standard, noncustomized applications software.■

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Carrying On About MicroMate

Good things come in small packages—and so does the MicroMate. This computer has no built-in terminal, but it packs a lot of power into a little space.

By John Davidson

Dynamite! That's the best way to describe the PMC-101 MicroMate computer from Personal Micro Computers, Inc., of Mountain View, CA.

Stuff 128Kb of memory, a 400Kb 5¼-inch disk drive, a 4 MHz Z80A, bank-switched CP/M Plus, three I/O ports and the power supply into a rugged metal package the size of a shoe box, put a $1075 price tag on it, and you've got it.

Technically, the MM is the best in its class, and all it needs is a magazine devoted to it to blow Apple, Radio Shack, Commodore and the others out of the water. (Wayne, what's the new magazine for next month?)

Terminal Separation

I must admit that there is a cosmetic problem with these comparisons. The MicroMate doesn't have a built-in console. It's often sold with a Qume 102 video terminal, but being frugal, I opted to use a terminal I already had and passed up the Qume. Of course, the appearance of the console and the feel of the keyboard are important factors (particularly to the newcomers among us), but MicroMate has no console or keyboard, hence no visual appeal.

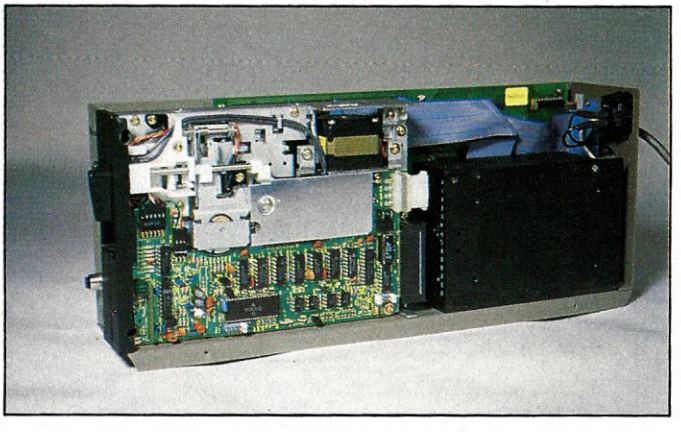
I consider this a plus. First, it makes the computer much more portable (two MicroMates will fit in a large briefcase), and most of my friends have RS-232C terminals I can plug in to. In a pinch, I carry a small TI 745 paper terminal. Secondly, with a separate RS-232C terminal, you can upgrade the terminal independent of the computer when you feel that you need more or different features or attributes.

Actually, in its ease and reliability of operation, it's difficult to tell where the MicroMate leaves off and the bank-switched CP/M Plus picks up. I don't plan to make a rigorous distinction here, because the computer comes with the Plus. To install the older regular CP/M, version 2.2, would be like taking a sandwich to a banquet.

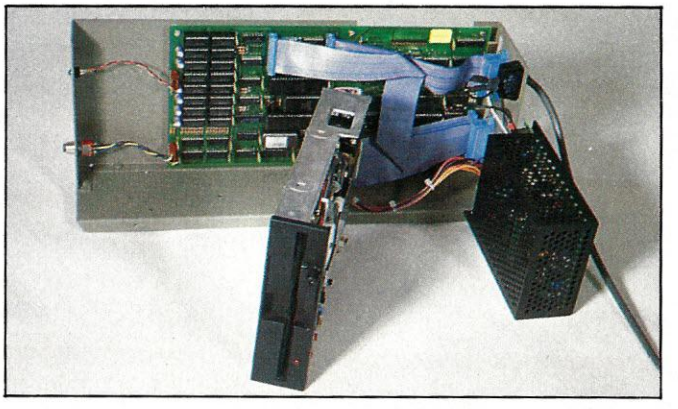
Programs Included

The MicroMate comes with Electric Webster, a spelling checker; CBasic, a top-of-the-line Basic compiler; and T/Maker III. T/Maker is a powerful

Address correspondence to John Davidson, c/o Microcomputing, 80 Pine St., Peterborough, NH 03458.



The MicroMate with the main circuit board exposed.



The MicroMate, side view. The disk drive is on the left and the power supply is on the right.

multipurpose screen-oriented text editor, database manager and spreadsheet program with bar chart graphics thrown in for good measure. I've experimented with it and it looks great, but I haven't used it enough to review it intelligently.

Robustness

One of the biggest pleasures of using the MicroMate is its reliability and robustness. In six months I have never had to hit the reset button, except for obvious errors of my own: running an off-the-wall experimental program that sent the computer into the weeds, or asking it to print to the parallel port with no printer connected.

Unannounced disk changes go without a hiccup, and even if you attempt a disk access with no disk in the slot (or the disk upside down), the computer waits patiently for a proper insertion; then it calmly proceeds without losing a bit.

Basically, the MicroMate is a powerful big board single-board computer that was washed in hot water and shrunk without losing any of its smarts. The Z80A CPU is backed up with a Z80A DART that provides two serial input/output channels (console and modem) with software-set bit rates and protocols, a Z80 CTC that serves as a clock for the CP/M Plus date-time stamp (with the other channel available for the user), a Western Digital 1797 double-sided floppy disk controller and two switched 64Kb banks of 4164 RAM. A Centronics-style parallel printer port is also provided.

Bank Switching

The back-switched memory is an important feature. Most microcomputers use 64Kb of memory or less, and that space generally accommodates both the operating system (CP/M) and transient programs.

Thus, an operating system for 64Kb (or less) is kept as small as is practical to leave room for the transient program area (TPA). Inherent commands, such as DIR, can't have many desirable features. User programs like spreadsheets that may have to handle lots of data usually check to see how much space the operating system has left them, but they rarely look for (or can use) more than 64Kb of memory, total.

Opening a second 64Kb bank of memory gives the transient program lots of space for itself and its files (it would otherwise have to shift on and off the disk). It takes the space pressure off the designers of the operating system, letting them include many nice bells and whistles in the form of commands and options that otherwise would have fallen by the wayside. CP/M Plus handles the bank switching from the back room where it lives and the transient program thinks it's in a 64Kb computer with a tiny operating system.

MicroMate Utilities

In addition to CP/M Plus and the programs mentioned above, MM comes with a set of good menu-driven utilities:

- CONFIG sets the number of disk drives (from one to four) as well as both a bit rate (50 to 19.2K bps) and protocol: numbers of bits, parity and XON/XOFF of either serial port (console or modem).
- Convert changes the read/write format of each of the disk drives (independently) from the MicroMate's native format to one of a menu of about 20 common five-inchers, including Osborne, Xerox 820, Kaypro, IBM PC and so on. The MicroMate isn't able to format these disks, but that usually isn't a problem unless you're in the program sales business.
- Backup duplicates disks using either multiple drives or a single one. With just the single internal drive, it gulps the disk contents into memory ten tracks at a time, pauses while you swap disks and then dumps to the destination.
- Format prepares 5¼-inch disks for data in either of the two (single-sided or double-sided) MicroMate native double-density disk configurations.

These utilities seem dull, but they (and their checks) are important initially. Once you receive your new computer, the first thing you have to do is make back-up disks. So, for your first operation with your new pride and joy, you are using the original release disks (normally an emphatic no-no) first to format and then to copy backup and working disks.

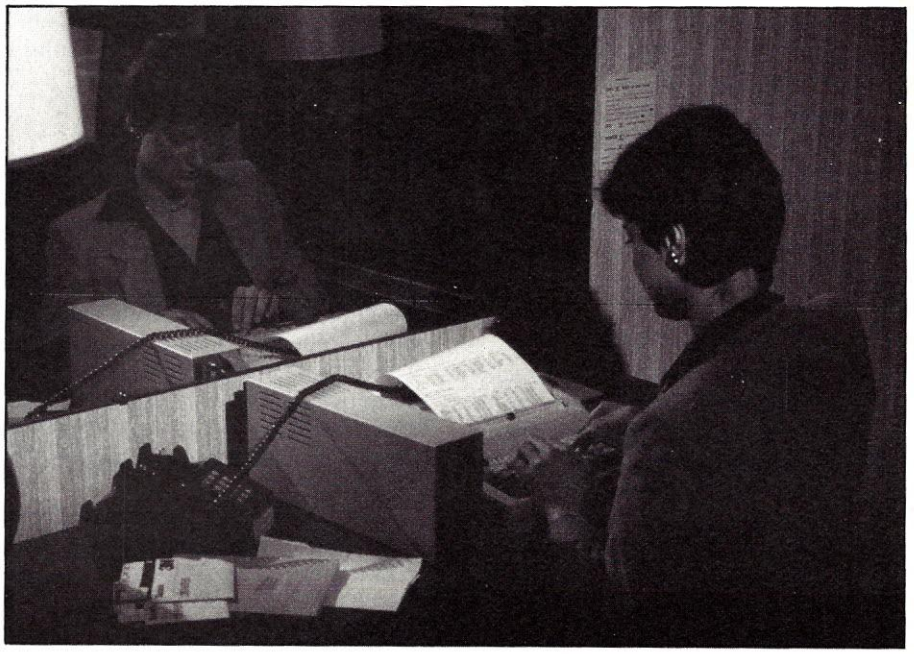
Any problem, slip of the finger or (God forbid) power glitch while you are doing this initial backup and you are into a hat-in-hand call to the vendor, complete with stammered explanations and a two-week delay before getting on-line. Of course, if you are like me, exuberance, excitement and enthusiasm are all there working against you.

Manufacturers have to provide for this and Personal Micro Computers, Inc. has done it well.

Documentation Flows Nicely

This brings us to the documentation provided with the MicroMate—there's plenty and it's excellent. The computer itself is explained in a neatly printed, 100-page, 8½ × 11 manual that covers installation, use of the utilities (with detailed steps for the disk back-up operation mentioned above), and hardware and software details of the computer.

The specifics of the CP/M Plus and disk interfaces are covered and augmented by complete source code on disk for all of the BIOS modules as



The MicroMate away from home, being used with a TI Silent 700.

well as submit routines for regenerating the CP/M Plus system.

Interfacing is meticulously covered: an entire page is devoted to each of the peripheral cables that you might need. The manual stops short of providing service information, and there is no schematic diagram for the computer.

The CP/M Plus system and its transient commands and utilities are well-covered in a separately boxed, three-ring binder prepared by Digital Research. Included are a 200 plus page user's guide, 170 pages of more technical Programmer's Guide, and another 300 pages of Programmer's Utilities Guide, explaining the assembly language package mentioned later in this review.

T/Maker III is well-documented in a hefty 8½ × 11 reference manual and a smaller, fully tabbed Quick Reference booklet that summarizes all commands, using multicolor printing for enhanced clarity.

A Real Plus

On the software side, CP/M Plus has been covered elsewhere, but there are a few features I'd like to mention. CP/M Plus comes with on-line help files, similar to those that user's groups have been offering. To be really useful, help files have to be long. Until recently, if you had help files on-line, there wasn't room for much else unless you had many disk drives.

With 400Kb floppies or a hard disk, however, help files are great. The CP/M Plus commands and utilities are included, and some of the newer user's group material is starting to come through with its own help files. There are also instructions included for writing your own.

A second extra that comes with CP/M Plus is a much improved (over CP/M 2.2) assembly language programming package—MAC, RMAC, LINK, LIB, SID, HIST, TRACE and XREF. If you're into dollar values, that's 300 bucks right there.

Command Line Editing

For the veteran CP/M 2.2 addict, CP/M Plus offers lots of welcome enhancements. One of my favorites is the command line handling. Several commands can be placed on a single line separated by exclamation points (as opposed to the 2.2, which requires that each command be entered and executed sequentially). Better yet is the command editing—Control-W recalls the previous CP/M Plus command and that command is then edited and reissued.

> For an old hacker, the installation was disgusting; I plugged the printer interface in and it worked—absolutely no challenge.

Suppose I am logged onto drive A and call a program on drive B, but (and this is about my speed) I neglect to preface the command with the required "B:". When the Plus informs me that it can't find my program (on drive A), I just type ↑W to recall the command, ↑B to return the cursor to the beginning of the line, then insert my "B:" and hit return. (The cursor doesn't have to be at the end of the line.) ↑A and ↑F step the cursor along the line nondestructively, and ↑G will delete one character.

Aside from correcting entry errors, command recall and editing is useful any time you use a long command string repeatedly, as when PIPping files or assembling with MAC. It's like a fast-acting, quick 'n' dirty Submit file.

Date-time Stamp

Another useful feature is CP/M Plus's date-time stamp. This is invoked from the keyboard, either for a single reading or for a continuous display (you can have the most expensive digital clock on your block). It can also be called by a program, and with date-time stamping set, the date-time of the last access of a particular program is shown in the disk directory. This helps to keep track of files (which is the latest?).

I've found another use for it. Often a complex program, such as T/MAKER or Pascal MT Plus, has a large number of small files on a disk and, during execution, these files call one another. This interaction is usually transparent.

If you are performing a single type of operation on a large data file, you can eliminate unneeded routines from the disk to save space. Running the operation with a small data file and then checking the date-time stamps in the directory indicates which routines are actually used for the operation.

Unfortunately, the MicroMate maintains the date-time in the CP/M Plus operating system from interrupts generated by the Z80 CTC. When the computer is shut off, the time is lost and must be reset when the computer is powered up.

Along with the date-time stamp, the MicroMate is capable of password protection for individual files. You select from three levels of protection: read, write or delete (or the default, none).

And a Big Buffer

Another surprise for CP/M 2.2 users comes with using PIP to transfer files to the MicroMate from another computer: the PIP buffer accepts about 48Kb in one gulp. Thus, even after expansion to hex using the Unload routine, fairly large command files can be PIPped in without taking special measures (such as using a modem program). When PIPping files out of a computer, the buffer size of the donor isn't a problem, but watch out for the receiver if it is running CP/M 2.2!

Expandability

A major feature of the MicroMate is its expandability. On its back is a Centronics printer connector. I have a dot matrix printer with parallel interface. For an old hacker, the installation was disgusting; I plugged it in and it worked—absolutely no challenge.

Also on the back is a disk drive connector in parallel with the internal disk drive. MicroMate sells two auxiliary disk drive packages: one with a single drive, for $545, which gives you two (with the one in the unit); and one with two drives, for $775, for a total of three. Of course, you can get your own drives and power supplies and it works as well, but you don't have the matching case. I haven't seen it, but there is word of a modification to use the new 96-track per inch drives for a total data storage per 5¼-inch floppy disk of nearly 800Kb!

Hard Disk

That steals a bit of the thunder from the last accessory I want to mention: a 11.2Mb hard disk for $1645. I've been

using one for about a month and it's great.

It's also powerful enough to require a license from the government to export it! Aside from the nearly infinite storage capacity, the speed increment over the floppy is more than noticeable during disk accesses like, for example, saves or other menu operations in WordStar.

The speed difference is particularly obvious in a file transfer operation (PIP, NEWSWEEP or whatever) between the hard disk and a floppy. The computer spends about ten times as long on the floppy for each gulp. However, the hacker in me got a bit of satisfaction from installing it. I reconfigured the CP/M system using simple, clear instructions and removed the computer's top to install the hard disk plug.

Thorns in the Roses

Nothing is perfect, and I've had problems with the MicroMate and/or CP/M 3.0. For example, when using WordStar, I can't run the Device command in one line like the book says. (Device is the command that changes printer port assignments and bit rates and it is apt to be run while using a word processor.) I've found that I have to use WordStar's R command to invoke Device, then enter changes after Device comes up, a minor problem. After a few abortive tries, the computer educated me and the problem went away.

Another little glitch is that the MicroMate *almost* supports RS-232C. RS-232C and the MicroMate manual both specify that DCD, data carrier detect, be furnished on pin 8 by the computer to the terminal. (On the modem plug it is an input to the computer from the external equipment.)

MicroMate doesn't, in fact, provide this signal. Most equipment disregards it, and jumping the connection in the cable plug is simple, but it took me a while to discover that the missing DCD was the reason why a particular terminal wouldn't work.

When installing the latest version I have (MDM709) of SIG/M's superb user group modem program, I found it didn't work properly when using the generic CP/M Plus file. I dug out the actual port addresses for the MicroMate's modem port in the Z80 DART (89 for data and 8B for status) and used the CP/M 2.2 version of the program. Now it works like gangbusters, with the exception of the bit rate change (which I didn't try to install) and the space available calculation.

The directory handling of CP/M Plus is different from CP/M 2.2. With the Plus, there is a BDOS call (Function 46) for free disk space. Rather than calculate the free space from the directory (whose structure has been changed), all the program has to do is ask; however, the older CP/M 2.2 programs don't know that.

A Terminal Converter?

Perhaps the most serious problem with the MicroMate isn't the hardware or the programming at all; it's the marketing. I've just seen the latest slick brochure from the manufacturer, and on the front page the MicroMate isn't a computer at all. It's a terminal converter, whatever that is!

I don't mind; my trusty and portable terminal converter is playing chess and Adventure, running T/Maker, PL/I, ADA and LISP/80, as well as a myriad of other commercial and user's group programs. I'm using it now to write this review. My MicroMate may not have converted any terminals, but it surely has converted me!■

A Capsule Look

Manufacturer: Personal Microcomputers, Inc., 475 Ellis St., Mountain View, CA 94043.

Price: $1075; $545 for single-drive auxiliary; $775 for double-drive auxiliary; $1645 for 11.2Mb hard disk.

Processor: Z80A, 4 MHz.

Memory: 128Kb RAM, bank-switched, 4Kb ROM, autoboot.

Disk Capacity: One internal 400Kb drive with three optional drives.

I/O Ports: Two 50 to 19.2K bps asynchronous serial ports; parallel Centronics-type printer port.

I/O Bus: Parallel, eight data lines, seven handshaking lines.

Dimensions: 3½ × 6½ × 15¾ inches; 8½ pounds.

Power: 117VAC, 50/60 Hz, 75 Watts.

Software: CP/M Plus; T/Maker III; Electric Webster; CBasic; utilities include Convert, Backup, Copyfil, Format, Config and Systest.

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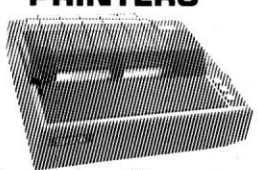
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Tell It to TI

If you've ever had a few words to say to your computer, the Texas Instruments Speech Command System lets you cut out the middleman (the keyboard) and voice your commands.

By Jim Heid
Microcomputing Technical Editor

Every computer manufacturer has its own idea of what makes a computer easier to use and interact with. Some think a mouse and windows are the answer; others are into menu-driven operating system shells; still others claim touch-sensitive screens are where it's at.

Texas Instruments is into speech.

That's not surprising when you consider that TI gave us Speak 'n' Spell and can claim a list of computer-speech innovations as long as your vocal cords.

Thanks to TI, your computer can now not only talk, but listen. The Speech Command System (SCS) is a package of hardware and software that lets your TI Professional Computer accept spoken commands and double as a telephone dialing and answering machine, a dictating machine and a talking calendar.

For you skeptics who think the only useful things you can say to a computer are four-letter words, let me say this: The system works. Some features work better than others, some are more useful that others, but in total, the system works. I do have some opinions on how valuable it is, however; I'll get to those later.

Address correspondence to Jim Heid, c/o Microcomputing, *80 Pine St., Peterborough, NH 03458.*

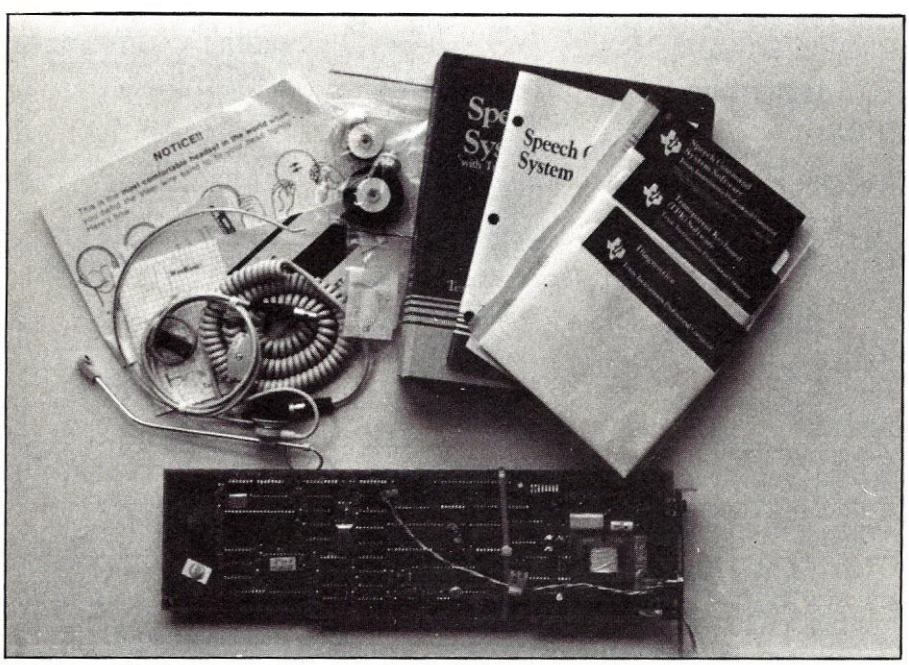


Photo 1. The complete Speech Command System.

The Hardware

The SCS hardware comprises two tightly-packed, piggy-backed circuit boards that go in one of the TI Professional's slots, a lightweight headset, a telephone connection cable, a diagnostic disk and a hardware manual (see Photo 1).

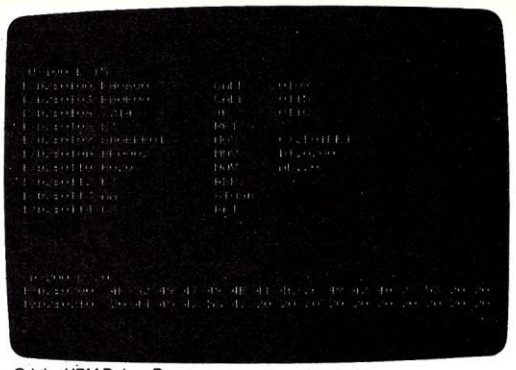
I won't describe here how the board works. For an overview of speech-recognition techniques, and some background on how SCS works, see "Computers Reach for Speech" by R.J. Dunne on p. 80 of this issue.

To install the board, you pop the top off the computer, locate an empty slot (any one except slot 1 or 5) and simply plug in the board and speaker connection. You then plug the headset into the back of the board (or attach an optional microphone) and attach the telephone cable from the computer to a modular phone jack (Photo 2).

It won't be quite that simple, however, if your computer has an internal modem. The internal modem and the SCS hardware are both two-board, piggy-back set-ups, and it's a tight fit squeezing them in.

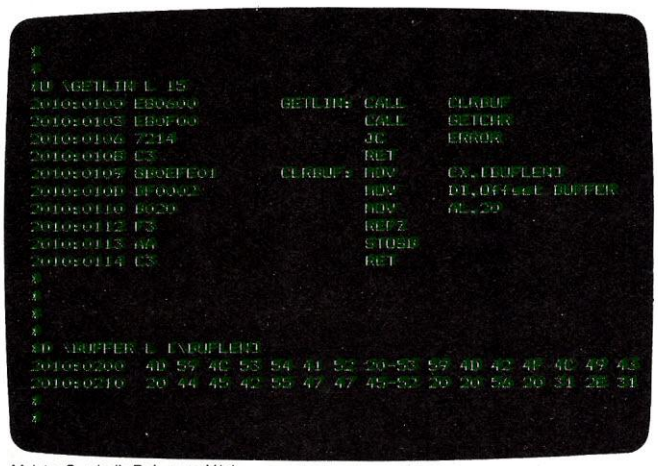
At first, I thought it would be downright impossible, but a call to Texas Instruments put me on the right track. To get everything to fit, set up your slots as follows: Your disk controller card goes in slot 1, the CRT/graphics card in slot 2, the modem in slot 3, the

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speech card in slot 4 and the communications card in slot 5. And you have to put the speech card in *before* the communications card. Bring a shoehorn.

After you get all the boards happily seated, the manual instructs you to run the accompanying diagnostic disk. The diagnostic puts the whole computer through its paces, then checks out the SCS board. If all is well, you'll hear a male voice come from the computer's speaker saying, "This is a test of voice quality for the speech processing board for the TI Professional Computer." No, the voice doesn't have a Texas accent, but the quality is excellent.

I found no traces of shoddy design or shortcuts in the SCS hardware. It performed reliably under long-term use and should continue to do so.

The Software

Quite a bit of software (no pun intended) comes with the SCS. The stuff that lets you control the computer with spoken commands is called the Transparent Keyboard or TPK for short.

The TPK responds to certain words and sends the computer characters or commands as if they were typed. If you have the MS DOS TPK activated, for example, you can say, "Show me the directory of drive B, return," and the letters DIR B: will appear on the screen, followed by a carriage return. The computer actually recognizes only the words "directory," "drive B," and "return," so you can say, "Oh, like, I wanna see the directory on drive B, poopsie, return;" the result will be the same. The commands that the MS DOS TPK recognizes are shown in Table 1.

Before you can use the TPK, however, you have to teach the computer about your voice sounds using the TPK's training mode. Training is a five-step process:

1) Calibrating, that is, setting up the computer for the best response to your voice with the input device (microphone or headset) you're using.
2) Speaking the words to be recognized for the first time. This is called enrolling your voice.
3) Updating the voiceprint you just enrolled a number of times. The manual recommends you perform this step at least three times for accurate speech recognition.
4) Testing the voiceprints to make sure that the computer can recognize your voice.
5) Updating any voiceprints that weren't satisfactorily recognized when you tested them.

A utility program handles the training process and makes it surprisingly easy. In the enrollment and updating steps, the screen presents a list of the words you're to say, with the current word highlighted in reverse video. When you test your voiceprint, the computer displays the word you're to repeat in reverse video. You're supposed to say the word in roughly the same tone of voice that you used when you first trained the system.

After you say it, the computer tells you how well it understood you by displaying a number between one and ten. This number represents what's called the "closeness of fit." A number less than four indicates that you should retrain the computer for that word; an accurate, reliable recognition usually gives a value of at least six. I was able to get a closeness-of-fit value as high as nine, but then, ahem, I have a superb speaking voice.

The results of the whole training process are stored in a voiceprint file, which has the extension VOC. Another file contains a list of words in the vocabulary, along with the keystrokes that are substituted when the computer recognizes a given word. A vocabulary file has the extension HDR.

The Possibilities

One vocabulary file can contain up to 50 words and their corresponding keystrokes. If that's not enough for your application, you can include, in a vocabulary file, an instruction that makes the SCS switch to a different vocabulary file at a predetermined time. For example, your MS DOS vocabulary file can be programmed to switch control over to your MS Basic vocabulary file when you enter Basic.

Included with SCS are vocabulary files for Easywriter II and Easyspeller II, Lotus 1-2-3, MS Basic, MS DOS, Microsoft Multiplan, Dow Jones NLX and pfs:File and Report. Each vocabulary file provides speech-input equivalents (the characters sent when a given word is recognized) for the most often used commands in that application.

You can also set up a vocabulary file for your own applications. The speech-input equivalents can be straight characters or control characters.

Soapbox Soliloquy

The Transparent Keyboard's voice recognition works reasonably well. The machine recognized my commands about 95 percent of the time. The system is remarkably forgiving if you pronounce a word differently or in a different tone of voice. It often recognized commands even when I mispronounced them somewhat or spoke in a higher or lower tone.

Now bring me my soapbox. The concept of controlling a computer by voice is great. Speech is a form of communication and interaction that's familiar to everyone. It's completely natural and requires no training or computer knowledge, and I believe that in the years ahead, many computers will offer the option of speech control.

However: (note that colon; it denotes a big "however") The Speech Command System doesn't give you complete vocal control over a computer; it lets you substitute a few commands with words, but you still have to type your filenames and any commands that the system doesn't know.

Second, you have to know something about computers to set up the system for a given application. The whole idea of computer speech recognition is to eliminate the need for computer novices to type cryptic commands,

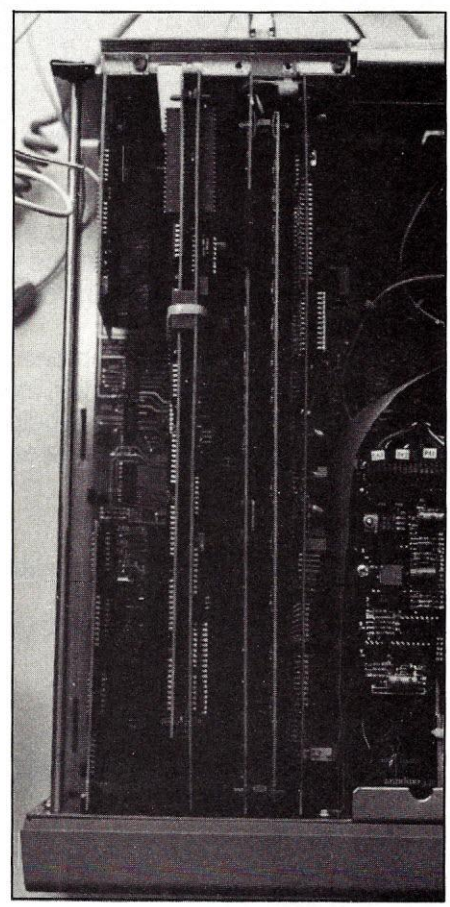
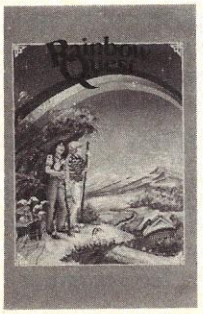


Photo 2. Installing the hardware. The SCS board is the second vertical board from the left.

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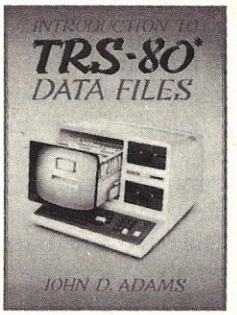
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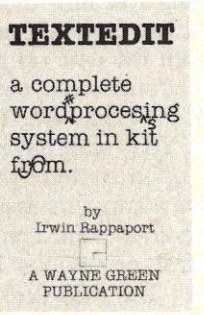
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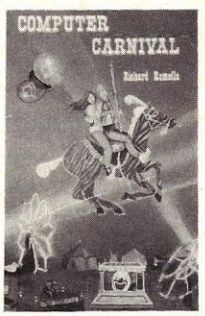
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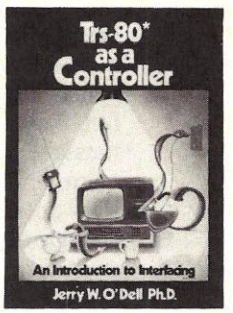
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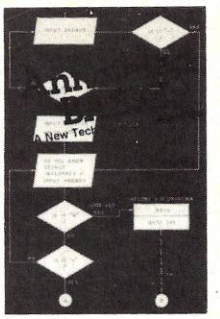
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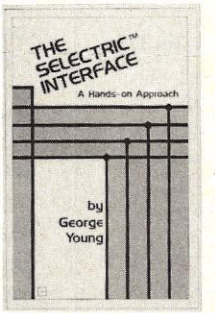
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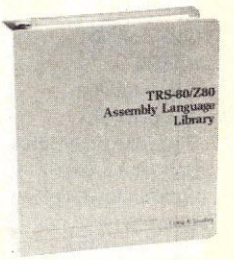
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yet you have to type cryptic commands just to activate the speech system. You should also know something about disk operating systems, batch files, control-key sequences and more. You have to teach the system what your voice sounds like. That means learning the utility software. Last, but certainly not least, you have to pull the case off the computer and fuss around with circuit boards to install the hardware. The bottom line is this: You sure have to know a lot to set up a system that's designed to make computers easier for novices.

Another point concerns the spoken control of various applications software. The SCS doesn't eliminate the need to learn a particular program. You still have to know Easywriter II's commands for merging, deleting and adjusting, for example, and you have to understand the concepts behind them. Although saying "merge" is definitely more logical than typing ALT-F8, you still have to understand the command—how it works, what parameters it requires and so on. Controlling hard-to-use software by voice isn't much easier than controlling it with the keyboard.

You Say This:	To Get This:
Copy to (F2)	~3C
All (F3)	~3D
Skip to (F4)	~3E
Template (F5)	~3F
Copy one (right arrow)	~4D
Back (left arrow)	^08
Cancel (down arrow)	~50
Insert (INS)	~52
Skip one (DEL)	~53
Echo on (PRNT)	~72
Echo off (PRNT)	~72
Continue (LINE FEED)	^0A
Return (RETURN)	^0D
Check disk	CHKDSK
Drive A	A:
Drive B	B:
Winchester	E:
Copy file	COPY
Verify	/V
Date	DATE
Delete	DEL
Directory	DIR
Page	/P
Wide	/W
Copy disk	DISKCOPY
New disk	/F
Format	FORMAT
System	/S
Rename	REN
Time	TIME
Type	TYPE
Ed-line	EDLIN

Table 1. The MS DOS transparent keyboard vocabulary.

One last comment, then I'll step down. One of the Speech Command System's big claims is that it makes computer use easier for executives who are scared of keyboards. But is an executive who's scared of a keyboard going to wear a headset on his or her head? I just can't imagine Joe Corporate putting a Lily Tomlin-like device on his $24 haircut.

By now you must be thinking that I hate the Speech Command System and wouldn't recommend it to my worst enemy. Not true, SCS is probably the best speech recognition system available for any microcomputer. It's reliable, accurate and uses state-of-the-art technology. But true, total speech control requires a lot more.

First, the headset has got to go. People do not want to wear a pilot-to-bombardier device just so they can say, "Show me a directory." Second, the computer has to be able to understand and translate filenames and words not in its vocabulary. That's years away and requires artificial intelligence techniques. Third, installing the hardware and setting up the software has to be easier. Computer phobics are scared to touch a keyboard; they certainly don't want to open its case.

Having rambled about that long enough, let's look at the system's other features. I like them.

Call Now!

What else can SCS do? It's a telephone-dialing machine, for one thing. One program it includes is a telephone management utility that lets you dial numbers from the TI's numeric keypad, its keyboard or from a stored phone directory.

The software essentially turns the TI Professional into an intelligent telephone with these features:

- redialing the last number called
- optional use of a microphone and speaker for conference calls
- optional use of the headset for hands-off phone calls
- eliminating incoming calls when you don't want to be interrupted
- adjusting the speaker or headset volume
- muting the input device (telephone receiver, microphone or headset)
- switching between pulse dialing and tone dialing
- speed dialing (which lets you dial a stored number with three keystrokes.)

An overlay is included that fits over the Professional's cursor-control cluster and labels the telephone functions.

The telephone directory management program can maintain 15 separate directories, each of which contains up to ten telephone numbers. Each directory and number within it can have a description assigned to it. A directory's description can be up to 56 characters long; a number's, up to 42.

You can also use voice input to dial a number. In fact, if you set up the proper vocabulary file, you can say "call the Pizza Barn," and your computer will place the call. Before you can use voice input to dial, you have to train the computer to understand the words it'll need to recognize, as described earlier.

Answering and Calling

An SCS-equipped Professional Computer is also a telephone-answering machine that you can program to answer the phone after a certain number of rings. The system can store up to five greeting messages, which you record using the headset, a microphone or your telephone.

The messages are stored in digital form on disk, which is also how your incoming messages are stored. The sound quality is about equal to that of a cheap microcassette recorder—some warble and an overall tinny sound, but acceptable for the application. When reviewing messages, you can fast forward and rewind through a message and adjust the sound's volume. You can also speed up or slow down the playback speed *without* changing the voice's pitch. I had a great time slowing my voice down to a molasses pace and speeding it up faster than an auctioneer's.

The phone-answering machine has lots of little extras; it tells you the length of a message in seconds and when it was recorded. You can also type a short description for each message to remind you of its contents.

The machine's nicest feature is that you can play and manipulate your messages from any touch-tone phone. It works this way: you call your phone number, and after the computer answers and plays your greeting message, you press the phone's asterisk (*) key twice. You'll hear a voice prompt saying, "Enter your password." The password is a four-digit number that you supply when you set up the answering machine; it's optional.

After you type your password, you hear, "Enter 1 to review new messages, 3 to review old messages or enter #1 to quit." New messages are

ones received since you last turned on the answering machine. Old messages are messages that were previously received, played and saved on disk.

Other commands are available. While a message is playing, you can skip to the next one, you can move forward or backward five seconds or you can stop and start playback. If you press the number sign (#) key and then T, a voice tells you the time and date a message was received. Finally, you can save or delete a message once you've played it.

The telephone-answering machine portion of the SCS is one of the things I like best about it. It's powerful, easy to use and works well. But wait, there's more to come.

Another SCS feature turns your computer into a calling machine that calls as many as ten phone numbers in a selected directory and delivers your recorded message. If you want replies, you can tell the machine to begin recording after it delivers the message. If the computer didn't get through to a given number, it will even call back after a preset time period. You can also specify how many times you want the caller's phone to ring before the machine goes on to the next number.

Other Goodies

The Speech Command System also has a calendar utility that can remind you of important events. The calendar has what's called a "tickler message" feature—it displays events that you denote with an asterisk below the Speech Command main menu. When the message is displayed, you must either acknowledge it by pressing F8, ignore it by pressing escape or exit by pressing break.

Last but not least, the SCS-equipped computer is a dictating machine that lets you store up to 50 files, each representing a separate recording, under one "directory." You can have as many directories as you have disk space.

Each file can have a description assigned to it, and you can play files with the same options that the answering machine gives—adjustable volume and speed, and forward/backward movement through a file.

A Final Speech

The Speech Command System is a unique product, and it isn't for everyone. With its phone-answering, dialing and directory features, it's best suited for somebody who works with the telephone. You can certainly get separate machines to do most of the things SCS can do, but if you already have a computer on your desk, especially the big-footed TI Professional, you may not have room for a lot more machinery. And it's nice to have all the features in one package. For someone who already owns a TI Professional and who does a lot of phone work, Speech Command is worth investigating.

I can't, however, recommend the transparent keyboard as an alternative to intimidating keyboards. The feature works well, but it doesn't recognize words that aren't in its vocabulary, and too much time is required to teach the system your voice. Although this is one of the best systems that today's technology can offer, true practical speech control of computers for noncomputerists is just not here yet.■

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Don't Strike Out

When lightning strikes, do you gasp, grab your computer and hide under your bed covers? If so, then you'll be interested in this article describing how to protect your computer from power line surges.

By Joseph Pimental

Most people have experienced, or know someone who has experienced, the effect of a lightning surge that makes a glob out of a television set or radio. With the increasing use of expensive electronic equipment, such as personal or home computers and video recorders, it becomes even more important to find ways to protect these surge-sensitive electronic machines from power line surges.

Lightning Strikes . . .

Power line surges can come from many potential sources—power company switching, motors starting and stopping and, most severe of all, lightning strikes that hit overhead electrical power lines and travel along these lines into your home.

Fig. 1 shows how a lightning strike can reach your house. Note that if you start with a typical 50,000-amp lightning strike on a power line, the lightning will follow the path of least resistance in its effort to reach ground. If the power company primary arrester turns on immediately and offers zero impedance to ground, the entire 50,000 amps will follow the path through the primary arrester to ground.

Unfortunately, primary arresters don't act quickly enough and the result is likely to be as shown in Fig. 1. Lightning divides and travels the many paths available in inverse proportion to the impedance it encounters.

The same thing happens to that portion of the lightning that enters your house. This is why a higher level of protection is needed the closer your computer is to the service entrance circuit breaker panel. Voltage surges that enter the wiring system of your home are likely to find the lowest impedance path to ground by breaking over one or more semiconductors in your computer.

The manufacturers of electronic equipment generally build in some degree of surge protection, but competitive pricing keeps built-in surge protection circuits to a minimum in most equipment. Computers are generally protected with a line fuse and, to some degree, by the power supply filter.

The power supply filter will smooth out small power line glitches that can cause the computer to operate erroneously. The line fuse, which is usually a slow-blow fuse, is intended to disconnect the computer from the power line if serious fault occurs in the computer. A large surge, such as one produced by a nearby lightning strike, won't be suppressed by either of these

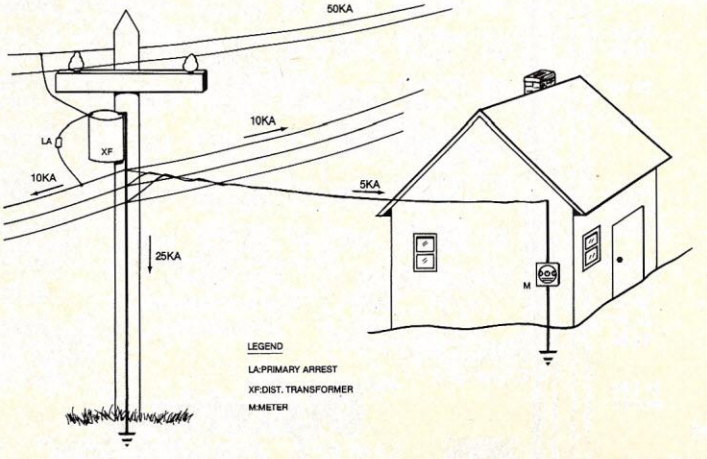


Fig. 1. Current division for a stroke to an overhead system.

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devices and can easily cause serious damage to a computer.

Today, a personal computer owner has the difficult job of selecting from the many available surge arresters the one that will do the best job for the least money. There are as many pitfalls as there are surge arresters on the market. In addition, the technical data for many of these devices is either very skimpy or totally absent.

Since there is no way of knowing if a surge arrester is actually doing its job, it is necessary to acquaint yourself with these devices and to ask enough questions to make sure that the surge arrester you select will suppress surges that may be generated from one source or another on the power system.

One of the more popular surge arresters available today plugs into the wall outlet; the computer is then plugged into the surge arrester. Some of these devices include EMI and RFI filters, which keep electromagnetic interference and radio frequency interference from affecting the computer. These devices may be important to computers installed near large EMI or RFI generators.

However, most electronic equipment manufacturers usually provide some protection against EMI/RFI. If your concern is for protection against large surges such as those caused by lightning, then a much more effective approach is to install a surge arrester at the service entrance circuit breaker panel, thus providing protection for the whole house's wiring system and all electronic equipment attached to it.

A Welcome Trend

In January 1981 the Institute of Electrical and Electronic Engineers (IEEE) published a standard defining power line surges (*Guide for Surge Voltage in Low Voltage AC Power Circuits*). The result of this rather extensive study is shown in part in Fig. 2.

Most reliable surge arrester manufacturers are using this IEEE standard as a basis for designing surge arresters. This trend should be welcomed by computer owners. The study points out that the voltage and current amplitudes as presented in the guide are an attempt to provide for the majority of lightning strikes but should not be considered the "worst case." Considering the unpredictability of lightning, protecting for the worst case could involve considerable cost, assuming it is technically feasible.

A few years ago, General Electric developed a metal oxide varistor (MOV), which is a semiconductor that operates like large back-to-back zener diodes. When connected in the service entrance circuit breaker panel (with short leads to minimize inductance),a MOV will turn on and divert to ground large surges within a few nanoseconds, which is fast enough to protect the most sensitive home electronic equipment.

> There are as many pitfalls as there are surge arresters on the market. Technical data for many is either skimpy or absent.

It should be understood that a properly applied MOV will only be in the on state during the period of time that its clamping voltage is exceeded. In the case of a 120V line, a clamping voltage of 500V or less is usually selected. The actual clamping voltage will vary slightly, depending upon the waveshape and magnitude of the surge. General Electric has extensively characterized its MOVs and much technical data is available from General Electric.

Smaller power line surges below the clamping voltage will not be suppressed by the MOV. However, the computer's own protective circuits and/or wall outlet surge arresters suppress these smaller surges.

Shopping Tips

An important aspect of selecting a surge arrester is its power-handling capacity. The IEEE guide recommends design levels at the circuit breaker panel of 3000 amps. Large General Electric-manufactured MOVs available for 120/240V circuits are about the size of a half dollar—32mm and 40mm in diameter. The 32mm size has a peak current rating of 15,000 amps and can absorb 200 joules of energy on a 120V line. This device should be adequate for use in the most severe lightning environments.

A 130V MOV will appear as an open circuit until the line voltage rises above the MOV clamping voltage of 365V. Once a surge voltage exceeds the clamping voltage the MOV will act as a short circuit and divert the surge to ground.

In order to do this before the surge can damage any equipment, the surge must be diverted within a few nanoseconds. General Electric's MOVs operate quickly enough to protect the most sensitive electronic equipment. In addition, the MOV must be able to absorb the energy generated by the surge passing through the MOV. These requirements can best be met if the MOV is installed in the service entrance circuit breaker panel with a short connecting lead.

In a recent technical paper, a General Electric Application Engineer wrote that a 32mm MOV installed in a branch circuit can be expected to operate satisfactorily for more than 28 years when subjected to surges as defined by the IEEE standard. The life of a 32mm MOV installed in the circuit breaker panel will be reduced slightly due to the higher level of surge that can be expected at the circuit breaker panel.

Two arresters are required for a three-wire 120/240V system. These plug-in surge arresters fit most service entrance circuit breaker panels, with the exception of Square D and Cutler Hammer. Since these devices can be installed without coming in contact with a hot power line, you can install them yourself. More information can be obtained from the author.■

Location Category	Impulse Medium Exposure Amplitude	Energy (in joules) Deposited in a Suppressor with Clamping Voltage of 500V (120 Volt System)
Long branch circuits and outlets	6,000 Volts 200 Amps	0.8
Major feeders, short branch circuits	6,000 Volts 3,000 Amps	40.0

Fig. 2. Surge voltages and currents deemed to represent the indoor environment and recommended for use in designing protective systems.

The Timing of Your Life

If all those loops in your programming toolbox still aren't doing the trick, try waving a timing flag— it's smooth, fast and, best of all, flexible.

By Harry Bee

In every creative endeavor, timing is as important as any other facet the craft involves. Creating a computer program is no exception.

The sort of timing I'm talking about is relational rather than durational. If you look at a computer program as a series of events (which is exactly what it is), a large portion of those events fall into sequences and cycles, and every computer language features a number of standard constructions for handling them.

For...next loops, do loops, formal loops, conditional loops, even dreaded endless loops and Hofstadter's strange loops are as common as ants at a picnic. So much so that I'll bet you've almost never written a program that doesn't use several. So why am I about to make a big deal about just another method of dealing with cycles and sequences?

In the first place, you can never have too many weapons in your arsenal with which to attack the problems of programming. But, more importantly, the technique I describe, when it applies, offers otherwise unattainable benefits. These benefits include smoother, and quicker routines, greater flexibility, fewer elements to keep track of and brevity.

My Challenge

I never had to deal with real-time graphics. Suffering under the elitist's notion that such things were foolish, I never intended to write an arcade game. Then a friend said, "Bet you can't do one."

Well, I'm as conceited as the next guy, so I responded (brilliantly, of course), "Oh, yeah?" That's how I found myself in an alien programming environment, in the midst of—what else?—aliens.

Never fearful, I was adequately armed with a laser that fired a burst at the alien. (That's a simplified description, but not by much. This was neither an ambitious nor very original project.)

The three objects were to move across the void, represented by an otherwise blank screen, in various directions at different speeds. The action was to be continuous. The burst would be fast, the laser half that speed, and the alien half of that. You'll notice how those proportions put the odds of blasting the evil creature firmly in my favor. I'm no fool.

Effecting the animation is a simple matter of cycling through the appropriate sequence of movement events. Since I understand cycles and sequences, I naturally reached for a comfortable device: the ubiquitous nested loop. Listing 1 and Listing 2 show the model of what I used, in Basic and Z80 assembly language mnemonics, respectively.

You'll find nothing unusual, dramatic or revealing in the model—but it didn't work. The motion was supposed to be as uniform as the mythical Mobius ring, but the counters the routine carried and the operations on them put a visible weld in the ring and destroyed the illusion. My display looked—in a word—lousy.

What to do? I wondered. Fire another volley? Activate my shields? Surrender? Perish the thought!

I heroically hemmed and hawed and scratched my head until, at last, dawn broke over the ossified landscape of my preconditioned thinking. In the end, I emerged from the battle not raising a white flag, but waving a "timing flag."

The Timing Flag

A timing flag is a single variable (byte or register) used in place of several separate variables that count cycles and sequences of events. Upon this single variable you need to perform only one operation: incrementation. Its *actual* value is of no consequence to its function, so it almost never has to be reset. It is independent of the cycle and sequences it controls. It can perform multiple simultaneous functions.

In Lieu of Loops

The timing flag's key derives from a fortunate property of binary numbers. Fig. 1 shows the first 16 incrementations of an eight-digit (bit) binary number. An appendix in the back of one of your manuals probably shows the whole sequence. There's a useful pattern there. The first, rightmost digit, for instance, is zero every other step. The first two digits are both zero every fourth step. The first three digits are all zero every eighth step. The pattern is similar for the other powers of two. Only the extent of the field of zeros increases. This is the flag's cyclical feature.

In addition, within every cycle, regardless of the number of steps, the sequence of digits is identical. For example, every four steps, the first two digits follow exactly the same

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pattern: 01, 10, 11, 00. This enables the flag's sequential feature.

To win the battle against the dratted alien, the routine I discovered, modeled in Listing 3 and Listing 4, uses the flag's cyclical feature. In the models, the timing flag, labeled Timer, replaces two variables (or registers) in the original. Timer is incremented four times each complete cycle. This is in contrast to six incrementations (or decrementations) per cycle of the two variables that control the loops in Listings 1 and 2.

To alternately enable and disable the laser movement routine, the program monitors the first binary digit of Timer, irrespective of its actual value, by ANDing it with 1. Similarly, the statement, Timer And 3, monitors the first two binary digits and enables the alien movement routine every fourth pass.

Finally, the original approach resets its two counters three times every cycle. Using the timing flag, you set it to zero at the beginning of the program and it never needs resetting.

In machine language, Timer needs only one byte to sustain the pattern. When the byte is full, 11111111 increments to 00000000 without interrupting the pattern. In high-level languages, however, the fact that most variables have upper and lower limits may seem like a major problem, since exceeding those limits produces an error. It's not.

Consider that Basic's simplest integer variable allows nearly 33,000 positive steps from zero. If that's not enough, then starting the variable at its lowest, negative limit (Let Timer = −32768) doubles the number of positive steps before overflow occurs.

If that's still not enough, the next most precise type of variable gives you several million steps to work with. If you're still squeamish, an error trap that resets the variable every billion cycles or so will provide absolute safety, but it's overkill.

How often will the proportional relationships in a program fall conveniently into powers of two? It happens quite often, actually. After all, the computer *is* a binary environment, and it is precisely for that reason that disk formats, I/O protocols and all manner of indigenous functions are commonly organized into neat, binary packages.

Interrupted Sequences

Having discovered the timing flag's power to control two or more loops, I soon realized its ability to control awkward sequences. I was writing a program to perform progressive calculations on the same set of variables. The calculations were similar except for the constants used. There were four distinct sets of constants employed in a predetermined order in each successive operation. That's easy. Set the constants into arrays K(0 through 3) and use the loop FOR T=0 TO 3 : R=FN(K(T)) : NEXT.

Not so easy. There were three problems. First, the calculations rarely occurred consecutively. Rather, they fell into an otherwise asymmetrical program flow in the midst of a host of other routines that included input and user's options. Secondly, the calculations might occur any number of times, from three to more than a dozen. The order in which the constants were used maintained its integrity and became cyclical, with the fifth occurrence using the first set, the sixth the second and so forth. But there was no way of predicting how many cycles or parts of cycles were necessary. It depended on the kind of construction the program was analyzing. The calculations might very well finish in the middle of a cycle. Thirdly, certain conditions, particularly options allowed the user, required the program to skip a step in the progression and go to the next set of constants.

This was no place for a formal loop with all its restrictions. An unresolved for. . .next stack producing the dreaded Next Without For error somewhere down the line was a distinct possibility.

There are many ways of constructing loops, but the timing flag, in this case, proved the most trouble-free solution. I set Timer to zero at the beginning of the calculations. The program then incremented Timer after each time the calculation was used. When conditions called for skipping a step, Timer was again incremented. Using those simple operations, the expression Timer And 3 resulted in values of 0, 1, 2 or 3 in the proper order through appropriately successive cycles, regardless of the actual value of the variable. If Timer were left dangling midcycle, it was independent and affected nothing.

And Counting, Too

In a board game implementation, the bookkeeping and display functions are generally common to both players, occurring between turns. The turns, however, alternate. The timing

```
10 FOR X=1 TO 2
20 FOR Y=1 TO 2
30 GOSUB 100
40 GOSUB 200
50 NEXT Y
60 GOSUB 300
70 NEXT X
80 GOSUB 400
90 GOTO 10
100 ' BURST movement routine
200 ' OTHER routines
300 ' LASER movement routine
400 ' ALIEN movement routine
```

Listing 1. Basic model.

```
CYCLE   LD      C,2
LOOP2   LD      B,2
LOOP1   CALL    BURST
        CALL    OTHER
        DJNZ    LOOP1
        CALL    LASER
        DEC     C
        JR      NZ,LOOP2
        CALL    ALIEN
        JR      CYCLE
```

Listing 2. Assembly language model.

```
10 LET TIMER=0
20 GOSUB 100
30 GOSUB 200
40 GOSUB 300
50 GOSUB 400
60 TIMER=TIMER+1
70 GOTO 20
100 ' BURST movement routine
200 ' OTHER routines
300 IF TIMER AND 1 THEN RETURN
310 ' LASER movement routine
400 IF TIMER AND 3 THEN RETURN
410 ' ALIEN movement routine
```

Listing 3. Timer routine.

```
BEGIN   XOR     A
        LD      (TIMER),A
CYCLE   CALL    BURST
        CALL    OTHER
        CALL    LAZER
        CALL    ALIEN
        INC     (TIMER)
        JR      CYCLE
LASER   LD      A,(TIMER)
        AND     1
        RET     NZ
ALIEN   LD      A,(TIMER)
        AND     3
        RET     NZ
```

Listing 4. Timer routine.

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flag is a simple way to control the alternation. Let's say T$(0) = "Machine's Turn" and T$(1) = "Player's Turn." The program will set Timer to 0 or 1 at the beginning of the game, depending on who plays first. It will also increment Timer at the end of the player's input routine and after the routine that determines the machine's play. As play alternates, the statement Print T$(Timer And 1) will display the appropriate message, and the statement On Timer And 1 Goto will branch to the proper routine.

0—00000000
1—00000001
2—00000010
3—00000011
4—00000100
5—00000101
6—00000110
7—00000111
8—00001000
9—00001001
10—00001010
11—00001011
12—00001100
13—00001101
14—00001110
15—00001111
16—00010000

Fig. 1. First 16 incrementations of an eight-bit binary number.

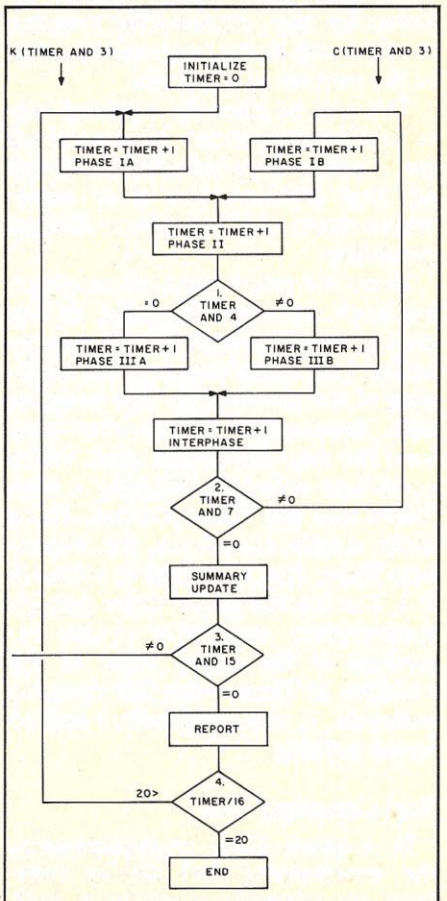


Fig. 2. Flowchart of timer functions.

I've cited this admittedly unremarkable example to introduce the third simultaneous use to which the timing flag may be put. Suppose the game is chess, in which it is at least customary and sometimes necessary to count turns and half turns. In this case, while the monitoring of the flag's first binary digit controls both the game's turn cycle and its alternating sequence, the variable's actual value records both half turns and turns (Timer/2) completed.

It's not such a large step from this example to the flowchart in Fig. 2 where Timer performs six separate functions. At decision point 1, Timer And 4 monitors the third binary digit. This allows the A Phase and the B Phase to share Phase II in common. At point 2, Timer And 7 monitors the first three binary digits. If true, the B Phase is initiated; if the expression equals 0 (not true), the summary and update is enabled.

At point 3, Timer And 15 either repeats the phases and summary or allows the report to be made. At 4, Timer/16 counts. When the count reaches 20, the routine ends. In addition, Timer And 3 selects the appropriate data in K or C for the various operations. Finally, within Phase II, Timer And 4 chooses between the two sets of data in the common operation.

By performing all of these duties, Timer stands in place of five separate counters that would have been used in a more conventional construction. The counters, had they been used, would have been set or reset 120 times. The timing flag is never reset.

Innumerable Applications

This has been a necessarily general discussion. To say that the timing flag applies to a mailing list in this way, or works that way in a spreadsheet or some other way in a simulation, is more limiting than illuminating. The timing flag is a device—another tool to keep in your programmer's toolbox—to use whenever the opportunity gives you more benefits than another device will. Considering the nature of computer programs and their propensity toward cycles, sequences and couting as a basic operation, this opportunity will present itself often.■

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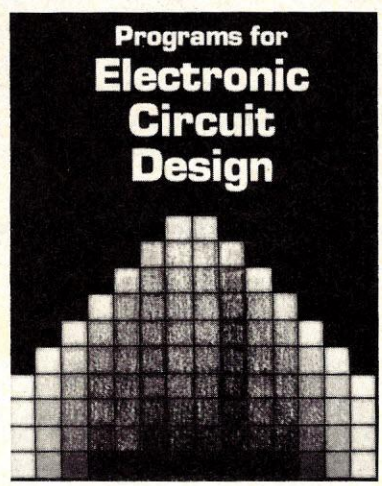
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Commodore's Condos Revisited

Author Ed Steinfeld offers this upgraded version of his rental analysis program—now you can track your property investments on your C-64.

By Ed Steinfeld

I have received letters and telephone calls telling me my program published in *Microcomputing*, December 1983 ("Commodore and Condominiums") won't work with the Commodore-64. Maybe the second time around won't cause the headache the first version caused with 40-column screens and no Print Using statement.

The SYS statement and the Print Using statements were obvious problems. What wasn't so obvious was that the long Input statements caused problems because they spilled over onto an extra screen line. In Listing 1, I have tried to eliminate all possible conflicts with other models of computers.

Conflicts will occur only with a Basic that uses a dedicated print statement for the line printer; LPrint is commonly used. Those users should replace each PRINT#4 with LPrint. Also the OPEN4,4 in line 470 and CLOSE4 in line 1540 can be eliminated. Line 250 can be changed for nonCommodore computers to whatever statement will clear the screen. It can even be deleted without causing problems with the operation of the program.

If you were able to get the first program to run, you'll find this version is a lot slower. The print formatting subroutine (lines 1840–2210) is not the most efficient way to format numbers. Since I wanted something I could reuse, it had to be adaptable to all sorts of numbers. I chose a routine recently printed in the *Commodore Microcomputer* magazine, issue 27.

Address correspondence to Ed Steinfeld, 31 Richman Road, Hudson, NH 03051.

The subroutine is entered with the number to format in variable V. It returns with the number formatted in seven ways. The formatted number is in string variables V0$ through V6$. Lines 1870–1930 of Listing 1 show the formats and associated string variable. Unlike the original subroutine, all formatted numbers have the same length. This way you can mix them in a single column and maintain spacing between columns.

Listing 2 is a sample of the printout of the program. It will format equally well on any Commodore or ASCII printer. For a description of the program, see *Microcomputing*, December 1983 (p. 52).■

Listing 1. Program for rental analysis that can be used on any 40-column screen computer by changing the print statement.

```
100 REM NEW RENTALS       28 DECEMBER 1983  COPYRIGHT (C) 1983
110 REM                   E.F. STEINFELD
120 REM   C-64            31 RICHMAN ROAD
130 REM   VERSION         HUDSON, NH 03051
140 REM                   (603) 889-8224
150 REM
160 REM CALCULATES MORTGAGE PAYMENT, MONTHLY EXPENSES,
170 REM             SETS RENT, AND  FIRST FOUR YEARS OF
180 REM             EQUITY BUILD-UP, CASH FLOW, ACRS
190 REM             DEPRECIATION, TAX SAVINGS, AND ROI.
200 REM
210 DEF FNR(A)=(INT((A+.005)*100))/100
220 DATA12,10,9,8,11,10,9,8,10,11,9,8,9,11,9,8,8,11,10,8,7,11,10,8
230 DATA6,11,10,9,5,11,10,9,4,11,10,9,3,11,10,9,2,11,10,9,1,12,10,9
240 DIM CF(4,6),CF$(4)
250 PRINT"□":REM** CLEARS SCREEN
260 PRINTTAB(12);"RENTAL ANALYSIS"
270 PRINT:PRINT"COPYRIGHT 1983 BY E.F. STEINFELD":PRINT
280 INPUT"PROPERTY:";A$:IFA$="" "GOTO280
290 INPUT"SALE PRICE    ($) =";S:IFS=0GOTO290
300 INPUT"DOWN PAYMENT  ($) =";D
310 INPUT"INT. RATE     (%) =";I:IFI=0GOTO310
320 INPUT"TERM      (YEARS) =";N:IFN=0GOTO320
330 INPUT"TAXES/YEAR    ($) =";T:IFT=0GOTO330
340 INPUT"FEES/MONTH    ($) =";F
350 INPUT"INSURANCE/MO.($) =";IN
360 PRINT:PRINT"SET PRINTER TO TOP OF FORM.
370 PRINT"PRESS RETURN WHEN READY."
380 GET0$:IF0$<>CHR$(13)GOTO380
390 TM=FNR(T/12)
400 P=S-D:P1=FNR(P)
410 X=P*I/1200
420 Y=(1+I/1200)↑(12*N)
430 M=X/(1-1/Y)
440 M=FNR(M)
450 X=(M+IN+TM+F)/.9
460 X=FNR(X)
470 OPEN4,4:PRINT#4:PRINT#4:PRINT#4:REM OPENS LINE PRINTER
480 REM FOR PC'S WITH LPRINT CHANGE ALL PRINT#4 TO LPRINT & * OPEN4,4
490 PRINT#4,"                              INVESTMENT PROPERTY ANALYSIS":PRINT#4
500 FORM1=1TO80:PRINT#4,"%";:NEXTM1:PRINT#4:PRINT#4
510 PRINT#4,"PROPERTY: "A$
520 V=S:GOSUB1870:S$=V6$:V=D:GOSUB1870:D$=V6$
530 PRINT#4,"SALE PRICE      ";S$;"DOWN PAYMENT";D$
540 V=P1:GOSUB1870:P1$=V6$:V=TM:GOSUB1870:TM$=V6$:V=T:GOSUB1870:T$=V6$
550 PRINT#4,"PRINCIPAL       ";P1$
560 PRINT#4,"TAXES/MONTH     ";TM$;"TAXES/YEAR  ";T$
570 V=F:GOSUB1870:F$=V6$:V=IN:GOSUB1870:IN$=V6$:V=I:GOSUB1870:I$=V2$
580 PRINT#4,"FEES/MONTH      ";F$
```

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Listing continued.

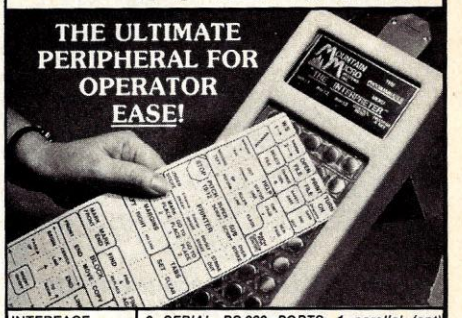
```
590 PRINT#4,"INSURANCE/MO.   ";IN$
600 PRINT#4,"INTEREST RATE   ";I$
610 V=N:GOSUB1870:N$=V0$:V=M:GOSUB1870:M$=V6$
620 PRINT#4,"TERM     (YEARS)";N$
630 PRINT"MORT. PAYMENTS     ";M$
640 PRINT#4,"MORT. PAYMENTS  ";M$
650 ME=M+TM+F+IN:V=ME:GOSUB1870:ME$=V6$
660 PRINT#4,"MO. EXPENSES    ";ME$
670 PRINT#4
680 PRINT"MO. EXPENSES       ";ME$
690 V=X:GOSUB1870:X$=V6$
700 PRINT"RENT SHOULD BE     ";X$
710 PRINT#4,"RENT SHOULD BE  ";X$
720 PRINT"DO YOU WISH TO SHOW CASH FLOW AND"
730 INPUT"DEPRECIATION (Y OR N)";Q$
740 IFLEFT$(Q$,1)="N"GOTO1530
750 INPUT"WHAT MONTHLY RENT WILL YOU USE";RE
760 V=RE:GOSUB1870:RE$=V3$
770 PRINT"WHAT MONTH WILL THE PROPERTY BE PLACED"
780 INPUT"IN SERVICE (JAN=1, FEB=2, ETC.)";M3
790 PRINT"WHAT AMOUNT OF THE"S$"SALES"
800 PRINT"PRICE IS ALLOWED UNDER THE ACRS 15 YEAR"
810 INPUT"DEPRECIATION METHOD ($)";S1
820 PRINT"WHAT ARE THE ESTIMATED SETTLEMENT"
830 INPUT"COSTS ($)";CL
840 V=CL:GOSUB1870:CL$=V3$
850 GOSUB1580:  REM CALCULATE EQUITY BUILD-UP FOR FIRST FOUR YEARS
860 GOSUB1700:  REM READ ACRS DEPRECIATION TABLE FOR FIRST FOUR YEARS
870 GOSUB1720:  REM CALCULATE DEPRECIATION
880 GOSUB1740:  REM CALCULATE CASH FLOW
890 PRINT"WHAT % PER YEAR PROPERTY APPRECIATION"
900 INPUT"DO YOU EXPECT";AP
910 INPUT"WHAT TAX BRACKET (%) ARE YOU IN";TX
920 PRINT#4:FORM1=1TO80:PRINT#4,"%";:NEXTM1:PRINT#4:PRINT#4
930 PRINT#4,"CASH FLOW ANALYSIS FOR PROPERTY: "A$
940 PRINT#4:PRINT#4,"ESTIMATE BASED ON THE PROPERTY BEING PUT INTO SERVICE";
950 PRINT#4,12-M3+1"MONTHS THE FIRST YEAR."
960 PRINT#4,"RENT HAS BEEN SET AT"RE$"PER MONTH."
970 PRINT#4,"ESTIMATED APPRECIATION"AP"% PER YEAR."
980 PRINT#4,"DEPRECIATION IS CALCULATED ON THE ACCELERATED COST RECOVERY ";
990 PRINT#4,"SYSTEM (ACRS) METHOD"
1000 PRINT#4,"FOR 15-YEAR PROPERTY. SETTLEMENT COSTS ARE ESTIMATED AT $"CL"."
1010 PRINT#4:PRINT#4
1020 I1$="                    "
1030 I1$=I1$+"YEAR 1        YEAR 2        YEAR 3        YEAR 4"
1040 PRINT#4,I1$
1050 FOR LX=1 TO 4:V=CF(LX,1):GOSUB1870:CF$(LX)=V6$:NEXT LX
1060 PRINT#4,"MONTHLY RENTS";CF$(1);CF$(2);CF$(3);CF$(4)
1070 PRINT#4
1080 FOR LX=1 TO 4:V=CF(LX,2):GOSUB1870:CF$(LX)=V6$:NEXT LX
1090 PRINT#4,"MORTGAGE      ";CF$(1);CF$(2);CF$(3);CF$(4)
1100 FOR LX=1 TO 4:V=CF(LX,3):GOSUB1870:CF$(LX)=V6$:NEXT LX
1110 PRINT#4,"TAXES         ";CF$(1);CF$(2);CF$(3);CF$(4)
1120 FOR LX=1 TO 4:V=CF(LX,4):GOSUB1870:CF$(LX)=V6$:NEXT LX
1130 PRINT#4,"FEES          ";CF$(1);CF$(2);CF$(3);CF$(4)
1140 FOR LX=1 TO 4:V=CF(LX,5):GOSUB1870:CF$(LX)=V6$:NEXT LX
1150 PRINT#4,"INSURANCE     ";CF$(1);CF$(2);CF$(3);CF$(4)
1160 PRINT#4
1170 FOR LX=1 TO 4:V=CF(LX,6):GOSUB1870:CF$(LX)=V6$:NEXT LX
1180 PRINT#4,"CASH FLOW     ";CF$(1);CF$(2);CF$(3);CF$(4)
1190 PRINT#4:PRINT#4
1200 PRINT#4,"RETURN ON INVESTMENT FOR "A$
1210 PRINT#4
1220 PRINT#4,I1$
1230 PRINT#4,"CASH FLOW     ";CF$(1);CF$(2);CF$(3);CF$(4)
1240 FOR LX=1 TO 4:V=X(LX):GOSUB1870:CF$(LX)=V6$:NEXT LX
1250 PRINT#4,"EQUITY BUILD ";CF$(1);CF$(2);CF$(3);CF$(4)
1260 AP(1)=5*(AP/100)*(12-M3+1)/12: REM 1ST YEAR APPRECIATION
1270 FORM1=2TO4:AP(M1)=(AP(M1-1)+5)*(AP/100):NEXTM1
1280 FOR LX=1 TO 4:V=AP(LX):GOSUB1870:CF$(LX)=V6$:NEXT LX
1290 PRINT#4,"APPRECIATION ";CF$(1);CF$(2);CF$(3);CF$(4)
1300 FOR LX=1 TO 4:V=D(LX):GOSUB1870:CF$(LX)=V6$:NEXT LX
1310 PRINT#4,"DEPRECIATION ";CF$(1);CF$(2);CF$(3);CF$(4)
1320 PRINT#4,"(ACRS)"
1330 PRINT#4
1340 PRINT#4,"ESTIMATED TAX BRACKET IS"TX"%"
1350 PRINT#4
1360 FORM1=1TO4:TX(M1)=D(M1)*TX/100:NEXTM1
1370 TX(1)=TX(1)+CL*TX/100
1380 FOR LX=1 TO 4:V=TX(LX):GOSUB1870:CF$(LX)=V6$:NEXT LX
1390 PRINT#4,"TAX SAVINGS ";CF$(1);CF$(2);CF$(3);CF$(4)
1400 PRINT#4
1410 FORM1=1TO4:RO(M1)=CF(M1,6)+X(M1)+AP(M1)+TX(M1):NEXTM1
1420 FOR LX=1 TO 4:V=RO(LX):GOSUB1870:CF$(LX)=V6$:NEXT LX
1430 PRINT#4,"R O I         ";CF$(1);CF$(2);CF$(3);CF$(4)
1440 PRINT#4
1450 PRINT#4,"DOWN PAYMENT"D$
1460 PRINT#4
1470 FORM1=1TO4:RI(M1)=FNR(100*RO(M1)/D):NEXTM1
1480 FOR LX= 1 TO 4:V=RI(LX):GOSUB1870:CF$(LX)=V5$:NEXT LX
1490 PRINT#4,"PERCENT R O I";CF$(1);CF$(2);CF$(3);CF$(4)
1500 PRINT#4
1510 FORM1=1TO80:PRINT#4,"%";:NEXTM1:PRINT#4:PRINT#4
1520 :
1530 PRINT:INPUT"ANOTHER FOR THIS PROPERTY (Y OR N)";Q$:Q$=LEFT$(Q$,1)
1540 PRINT#4,CHR$(12):CLOSE4  :REM  CLOSE4 CLOSES LINE PRINTER
1550 IFQ$<>"Y"THEN END
1560 PRINT:PRINT:INPUT"DOWN PAYMENT ($) =";D:V=D:GOSUB1870:D$=V6$:GOTO400
1570 :
1580 FORM1=1TO4:X(M1)=0:T(M1)=0:NEXTM1
1590 M4=M3:FORM2=1TO4:GOSUB1600:NEXTM2:RETURN
1600 FORM1=12TOM4STEP-1
1610 IT=(I/1200)*P
1620 X(M2)=X(M2)+M-IT
1630 P=P-(M-IT)
1640 T(M2)=IT+T(M2)
1650 NEXTM1
1660 T(M2)=FNR(T(M2)):X(M2)=FNR(X(M2))
1670 M4=1
1680 RETURN
```

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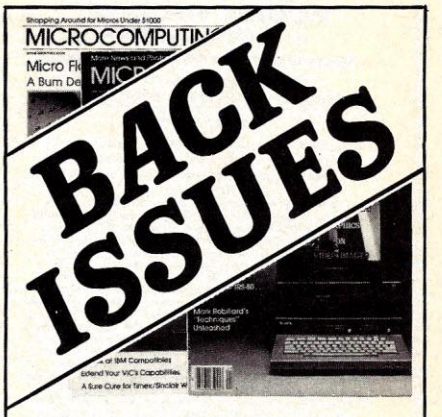
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CLOCK/CALENDAR	*(option) Time: hours:min.secs (18:43.54) Date: day/month/yr (25/12/83)*
KEYBOARD	*Tactile feel for operator feedback.*
REMOTE CONTROL	*All features may be controlled from computer via control codes.*
BATTERY BACKED	*Key-sets and clock/calendar.*
CONNECTION EASE	*Connect Interpreter in series with terminal or use as peripheral attached to computer via serial port.*
STYLE	*Slim, handsome design with stand for convenient placement next to keyboard.*
COMPONENT TYPES	*8085, 8155, 2716, 6116, 8251, MM58167*
O.E.M.	*Modular INDUSTRIAL design allows modification for your applications. Program code is downloadable same as keysets.*
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Listing continued.

```
1690 :
1700 RESTORE:FORM1=1TOM3:FORM2=1TO4:READD%(M2):NEXTM2:NEXTM1:RETURN
1710 :
1720 FORM1=1TO4:D(M1)=FNR((D%(M1)/100)*S1):NEXTM1:RETURN
1730 :
1740 REM  CF(YEAR,RENT - MORTGAGE - TAXES - FEES - INSURANCE - CASH FLOW)
1750 M1=12-M3+1
1760 CF(1,1)=RE*M1:CF(1,2)=M*M1:CF(1,3)=TM*M1:CF(1,4)=F*M1:CF(1,5)=IN*M1
1770 CF(1,6)=CF(1,1)-CF(1,2)-CF(1,3)-CF(1,4)-CF(1,5)-CL
1780 FORM1=2TO4
1790 CF(M1,1)=RE*12:CF(M1,2)=M*12:CF(M1,3)=T:CF(M1,4)=F*12:CF(M1,5)=IN*12
1800 CF(M1,6)=CF(M1,1)-CF(M1,2)-CF(M1,3)-CF(M1,4)-CF(M1,5)
1810 NEXTM1
1820 FORM1=1TO4:FORM2=1TO6:CF(M1,M2)=FNR(CF(M1,M2)):NEXTM2:NEXTM1
1830 RETURN
1840 REM** SUBROUTINE  V0123456$
1850 REM** COMMODORE MICROCOMPUTING MAGAZINE ISSUE 27
1860 REM** MODIFIED BY E.F. STEINFELD
1870 L0=12:REM V0$  RIGHT JUSTIFIED V
1880 L1=12:REM V1$ -> 12345678<- ROUNDED (V*100)
1890 L2=12:REM V2$ -> 123456.78<- ROUNDED
1900 L3=12:REM V3$ ->$ 123456.78<- ROUNDED
1910 L4=13:REM V4$ -> (123,456.78) <- ROUNDED
1920 L5=13:REM V5$ -> 123,456.78-<-
1930 L6=13:REM V6$ ->$123,456.78-<-
1940 V0$=STR$(V)
1950 L=LEN(V0$):IFL<L0THENV0$=" "+V0$:GOTO1950
1960 VR=V*100+.5:UY=VR:VR=(INT(UR))/100:V$=STR$(VR)
1970 VX=VAL(V$)*100:V1$=STR$(VX)
1980 L=LEN(V1$):IFL<L1THENV1$=" "+V1$:GOTO1980
1990 Q=LEN(V$)
2000 FORL=QTO1STEP -1
2010 IFMID$(V$,L,1)<>"."THENNEXTL:V$=V$+".00":GOTO2030
2020 IFL=Q-1THENV$=V$+"0"
2030 V2$=V$:V3$="$"+V$
2040 L=LEN(V2$):IFL<L2THENV2$=" "+V2$:GOTO2040
2050 L=LEN(V3$):IFL<L3THENV3$=" "+V3$:GOTO2050
2060 NG=0:IFV<0THENNG=1
2070 L=LEN(V$):L=L-1:V4$=RIGHT$(V$,L)
2080 V5$=V4$:IFL=<6THENGOTO2120
2090 VA$=LEFT$(V4$,L-6):VB$=RIGHT$(V4$,6):V4$=VA$+","+VB$:V5$=V4$
2100 V5$=V4$:IFL=<10THENGOTO2120
2110 L=L+1:VA$=LEFT$(V4$,L-10):VB$=RIGHT$(V4$,10):V4$=VA$+","+VB$
2120 IFNGTHENV4$="("+V4$+")":GOTO2140
2130 V4$=" "+V4$+" "
2140 L=LEN(V4$):IFL<L4THENV4$=" "+V4$:GOTO2140
2150 IFNGTHENV5$=V5$+"-":GOTO2170
2160 V5$=V5$+" "
2170 V6$="$"+V5$
2180 L=LEN(V5$):IFL<L5THENV5$=" "+V5$:GOTO2180
2190 L=LEN(V6$):IFL<L6THENV6$=" "+V6$:GOTO2190
2200 V0$=V0$+" ":V1$=V1$+" ":V2$=V2$+" ":V3$=V3$+" "
2210 RETURN
READY.
```

```
PROPERTY: TYPICAL CONDO
SALE PRICE          $42,000.00 DOWN PAYMENT     $9,100.00
PRINCIPAL           $32,900.00
TAXES/MONTH             $84.17 TAXES/YEAR       $1,010.00
FEES/MONTH             $145.00
INSURANCE/MO.            $0.00
INTEREST RATE            12.50
TERM     (YEARS)            30
MORT. PAYMENTS         $351.13
MO. EXPENSES           $580.30

RENT SHOULD BE         $644.78

CASH FLOW ANALYSIS FOR PROPERTY: TYPICAL CONDO

ESTIMATE BASED ON THE PROPERTY BEING PUT INTO SERVICE 7 MONTHS THE FIRST YEAR.
RENT HAS BEEN SET AT    $ 595.00 PER MONTH.
ESTIMATED APPRECIATION 5 % PER YEAR.
DEPRECIATION IS CALCULATED ON THE ACCELERATED COST RECOVERY SYSTEM (ACRS) METHOD
FOR 15-YEAR PROPERTY. SETTLEMENT COSTS ARE ESTIMATED AT $ 2500 .


                      YEAR 1        YEAR 2        YEAR 3        YEAR 4
MONTHLY RENTS      $4,165.00     $7,140.00     $7,140.00     $7,140.00

MORTGAGE           $2,457.91     $4,213.56     $4,213.56     $4,213.56
TAXES                $589.19     $1,010.00     $1,010.00     $1,010.00
FEES               $1,015.00     $1,740.00     $1,740.00     $1,740.00
INSURANCE              $0.00         $0.00         $0.00         $0.00

CASH FLOW          $2,397.10-      $176.44       $176.44       $176.44

RETURN ON INVESTMENT FOR TYPICAL CONDO
                      YEAR 1        YEAR 2        YEAR 3        YEAR 4
CASH FLOW          $2,397.10-      $176.44       $176.44       $176.44
EQUITY BUILD          $60.83      $115.11       $130.35       $147.61
APPRECIATION       $1,225.00     $2,161.25     $2,208.06     $2,210.40
DEPRECIATION       $2,940.00     $4,620.00     $4,200.00     $3,360.00
(ACRS)

ESTIMATED TAX BRACKET IS 44 %

TAX SAVINGS        $2,393.60     $2,032.80     $1,848.00     $1,478.40

R O I              $1,282.33     $4,485.60     $4,362.85     $4,012.85

DOWN PAYMENT       $9,100.00

PERCENT R O I          14.09         49.29         47.94         44.10
```

Listing 2. Sample printout of investment property analysis.

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EDUCATIONAL — A or An ● Arrow Facts ● Big Math ● Element Chart Eliza ● Europe ● Hang Math ● Linear Prog. ● Loops Marblestat ● Math Facts ● Number Match ● World Quiz

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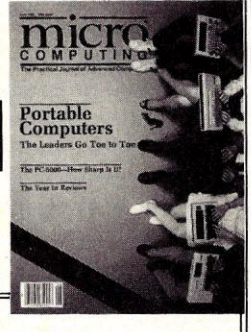
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Micros Go To the Movies

Videodisks are renowned for their computer-aided instruction capabilities, and now you can use your micro to control both still and moving images—all at an affordable price.

By Donald Skiff

You're at the controls of a space vehicle as the galaxy unfolds in front of you on the video screen. Manipulate the controls and the image changes, responding to your decisions. This isn't a cartoon-type image, as in hundreds of arcade game machines, but a lifelike representation, something out of "Star Wars." Everywhere you turn, the image is different.

Or you've prepared an entertaining yet effective teaching unit for your science students, an interactive computer-aided instruction (CAI) program. You give them breathtaking NASA photographs and filmclips combined with your own prompting messages and question sequences. It's a custom-made program with commercial-quality visual and audio teaching elements.

How can you do it on your budget? With videodisks.

Wait a minute—how can you afford to make a videodisk for personal use? Where can you find images to copy without violating copyright laws?

The material is out there and it's getting more and more plentiful as videodisk producers respond to a growing demand. You don't copy anyone's disk or make your own. Instead, you use existing disks, selecting the sequences you want with your own microcomputer.

Address correspondence to Donald Skiff, Datascribe, 116 Chapin St., Ann Arbor, MI 48103.

Touted for their random-access and still-frame capabilities, videodisks are feasible for multiple-branching CAI programs, combining still and moving images with computer text and graphics and for archival storage of large numbers of still images. Up to 54,000 separate frames are stored on one disk, in still or moving sequences.

That's 30 minutes of motion at normal playing speed or a slide program 75 hours long at five seconds per slide. Combine all those images with a moderate amount of computer power and memory, and you'll get lost in many twisting mazes before you see the same image twice.

I received some flyers from Video Vision Associates in Madison, NJ advertising a series of space and astronomy disks with motion, still and audio segments (much of which come from NASA and JPL). Although most are expensive ($320 each), the disks offer both still and motion sequences. They're a natural to use along with a computer program that selects and controls the viewing sequences for, say, a science class.

Here's where you and your microcomputer come in. Let's say you're a science teacher and you want to use the Video Vision disk about the Space Shuttle for a self-study unit. This disk is only $39.95 and comes with a printed directory. Indexes on the disk direct the viewer to various locations for material of interest.

You can program your computer to access these segments in any order, use the built-in indexes or bypass them, and provide study questions after each segment with wrong answers causing the segment to repeat. In other words, you can use the images and audio tracks to suit your own purposes—for individual study or for different grade levels or study units.

How It Works

You probably know the basic principles of the laser, or optical, videodisk. As a brief review, the digital code is stored in microscopic pits under a transparent coating and read by a little laser pickup that senses the difference in reflectivity between pits and background. The pickup can be positioned anywhere over the surface of the disk very quickly because it never touches the disk. It's like a floppy disk, except that it's read-only and holds much more data.

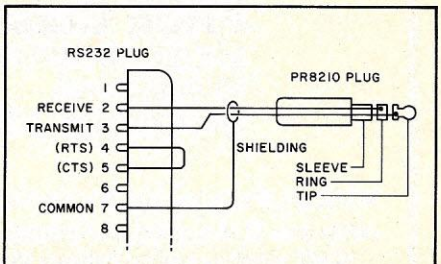


Fig. 1. Cable for Pioneer PR8210 computer control.

The laser player uses two types of disks. On a constant angular velocity (CAV) disk, a frame of video is displayed from a single rotation of the disk, so each frame can be read continually (freeze frame). The CAV disk holds 54,000 frames, enough for a half hour of normal motion.

The constant linear velocity (CLV) disk doesn't turn at the same speed all the time, and each rotation doesn't necessarily contain a single frame. This rules out freeze-frame display. Its advantage is that it can hold an hour of material on one side.

Most feature movie disks are CLV, while most disks made for interactive use are CAV. You can control a CLV disk with your computer, except for functions involving freeze-frame display. I'll describe those functions later; most of my descriptions here apply to the CAV disk.

The control circuitry in the disk player keeps track of the pickup position and can place the pickup at any of the 54,000 frames in seconds. Then it begins normal motion, displaying the video images at 30 frames per second and playing the audio tracks; it can move at slow or fast motion (without sound), or it can display only one selected frame.

A small digital program, usually placed on the disk itself, tells the player where "chapters" are and instructs it to stop at specified places (such as at the ends of chapters or at selected frame numbers). The display and audio resume when you press a button on the player. Chapter and frame numbers can be displayed along with the video image, by either the control program or the user controls. The built-in control program is used to control most of today's interactive disks but it isn't the only method possible, if the player has a port for external computer connection.

Most feature movie disks are CLV; most disks made for interactive use are CAV.

Not all laser disk players have such a port. Those ranked as industrial players do, but consumer models respond only to their own control panels or remote control units.

I priced the Pioneer consumer player model LD-1100 at $795 here in Ann Arbor and got a list price of $950 for their low-end industrial model PR8210. Both have remote control boxes, variable slow speed and noise reduction circuits. The industrial model is said to have heavier drive motors.

The PR8210 has a serial port for external connection. It's not a standard RS-232C port, but an application note from Pioneer shows how to control it with a computer RS-232C connection. A higher-priced ($1200) model LDV-1000 has a bidirectional parallel port. An OEM model, also with parallel port, is promised.

Sony's only available interactive player model LDP-1000 sells for $3100 and has a true RS-232C control port, with communication rates from 300 to 9600 bits per second (bps).

Let's look at how to connect and program the Pioneer PR8210 and the Sony LDP-1000.

Making the Connection

The Pioneer Model PR8210 has a miniature stereo jack (⅛-inch, three conductor) on the rear panel marked Ext Control. The tip connection is for input from the computer, and the ring is an output connection from the player; the sleeve is common. The output is only a busy signal during startup, shutdown and search. It does not acknowledge input to the port, so your commands have to be timed for acceptance by the player.

Use a shielded cable to connect the machine to your computer. The tip connection goes to the transmit data pin of the RS-232C port, and the ring connection to the receive data pin. The shield goes to pin 7. The other two pin numbers (2 and 3) depend on whether your port is set up for a terminal or a modem. If your computer needs handshaking, you have to connect pin 4 (request to send) to 5 (clear to send), and perhaps pin 20 (terminal ready) to 8 (data carrier detect). Check your computer manual for I/O requirements. Fig. 1 shows a typical cable arrangement.

The player accepts and sends at TTL (5V) levels. If you can, switch your port to TTL levels rather than regular RS-232C (±12V) levels. You won't hurt the player with 12V signals but your input may not recognize the smaller voltage sent by the player. Some I/O boards can be rewired easily to TTL voltages—see Fig. 2 for a typical arrangment.

Use a ten-bit data format with one start bit, seven data bits, no parity bit and two stop bits.

You can use eight data bits if the high-order bit is always set. In this case, use one stop bit. Configure the port to operate at 4800 bps.

The Sony LDP-1000 uses an Intel 8251 USART (Universal Synchronous-

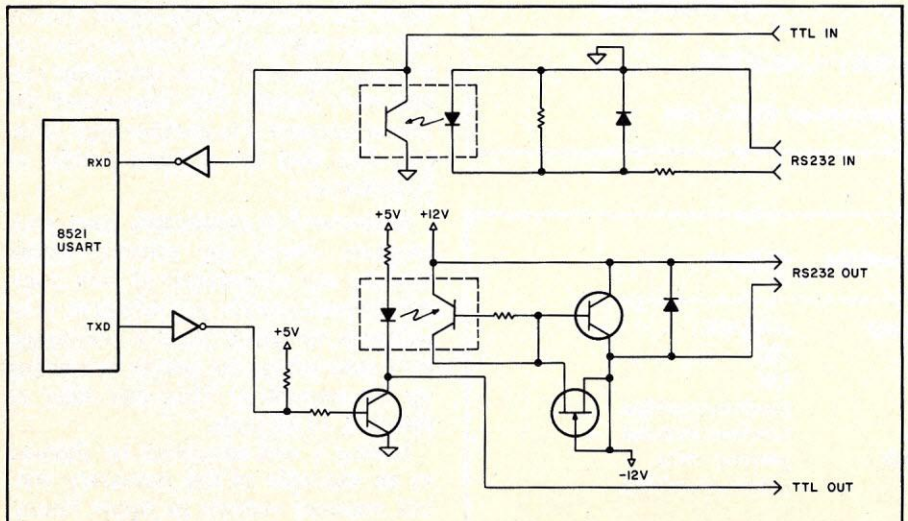


Fig. 2. A typical circuit for wiring an RS-232C port for TTL voltage levels.

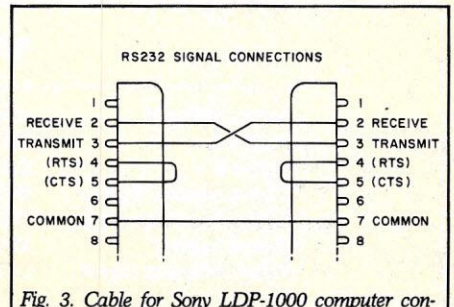


Fig. 3. Cable for Sony LDP-1000 computer control.

Have your program check for activity before sending any command. If your computer won't read it, put delays in your software so a command won't be sent when the player is starting up or searching.

Asynchronous Receiver-Transmitter) chip with handshaking and adjustable bit rates. Switches behind the front panel control bit rate, number of stop bits and word length. The factory setting is 1200 bps, one stop bit and eight-bit words.

The connections to the computer are illustrated in Fig. 3. This is pretty standard, so you can probably use a commercial cable. Be sure pins 4 and 5 are jumpered together on both ends, however.

Software to Control the Videodisk

The Pioneer PR8210 accepts pulse-coded commands from its remote control unit; you must emulate these commands with your computer. Actually, the remote control unit creates pulses from "bursts" of a 38 KHz carrier signal, but the player will also accept single pulses of 260 microseconds in length. (An earlier Pioneer model VP1000 required this 38 KHz carrier for computer control.) At the suggested transfer rate of 4800 bps, you can make all the control commands with combinations of three ASCII characters:

N—(uppercase)—4E hex
@—(at sign)—40 hex
~—(tilde)—7E hex

The commands to the disk player are shown in Table 1. These commands are the same as those that identify the buttons on the remote controller for the player. Read the instruction manual for a description of their use. The command codes are strings of ASCII characters that produce the proper binary sequences through a standard serial port, provided the characters are transmitted one after the other without extra delays. (Some computers execute housekeeping routines periodically, upsetting your timing calculations.)

The actual binary codes, with timing requirements, are in the *PR8210 User's Guide*, TP106, available from Pioneer. Each command word must be sent at least twice, separated by about ten milliseconds (ms). Because the player must read two identical words to respond, write your program to send three or four; the player ignores the extra ones.

Insert a delay of 75 to 100 ms between different commands. If the busy line from the player is active (a 2 Hz square wave), do not send any commands or they will be lost. When the busy line is quiet, it is low (0 volts). Your I/O software may report the active busy signal as an overrun error, or a break signal. If your operating system can't handle this, disconnect the line or connect it to another type of input, like that for a game paddle or pushbutton.

However it is connected, have your program check for activity before sending any commands. If your computer won't read it, put delays in your software to make sure a command isn't sent when the player is starting up or searching. This can take as much at 15 seconds.

Listing 1 was furnished by Pioneer as an example of the necessary control routines written in Apple Pascal. Listing 2 is my translation of these routines written in Heath's Benton

For this command	Send this string*
Play	@N@@TNN@
Search	@N@@@TNN
Frame	@N@TN@@N
Chapter	@N@N@@N@
0	@N@NN@N
1	@N@@NTN@
2	@N@TNTN@
3	@N@@@NN
4	@N@N@TN@
5	@N@@TN@N
6	@N@TTN@N
7	@N@@@@TN@
8	@N@NTTN@
9	@N@@N@@N
Audio Channel 2 (R) (toggle)	@N@@TTNN
Audio Channel 1 (L) (toggle)	@N@TTTNN
Step Forward (still mode)	@N@N@NN
Step Reverse (still mode)	@N@@N@N@
Scan Forward	@N@TNNN
Scan Reverse	@N@@@@NN
Slow Forward (rate set on front panel)	@N@@@NN@
Slow Reverse (rate set on front panel)	@N@NTNN
Fast Forward (3 times play speed)	@N@@NNN
Fast Reverse (3 times play speed)	@N@TTNN@
Pause (no display)	@N@TN@N@
Reject (end of program)	@N@@@@@N@

* The T is used here to represent the tilde (~), ASCII 7EH

Table 1. Pioneer PR8210 commands through RS-232C port.

	At Power On	At Reset
Laser read head	at HOME	at HOME
Audio 1	ON	ON
Audio 2	ON	ON
Frame number display	OFF	previous condition
Chapter number display	OFF	previous condition
Search register	FRAME 1	previous value
Noise reduction circuit	OFF	previous condition

Table 2. Pioneer PR8210 initial conditions.

Harbor Basic. Fig. 4 is the same thing in flowchart form so you can write your own.

Insert these routines into your program. Do not send any carriage returns or other characters to the player or it will become confused and refuse to cooperate. (Some computer operating systems automatically append a carriage return after a given number of characters in a string.)

A Typical Sequence

When a disk starts, some player functions are set but others retain previous settings. Table 2 shows initial conditions at power up and after Reject.

Say you've inserted a disk in the player and turned the power on. At this point, you can toggle either audio track off or begin normal play. To start the disk, send a play command. Delay for one second while the player prepares itself, then begin testing for the busy signal. When it stops, send the next command. This can be any command, such as Search (followed by the type of search, frame or chapter, then the address of the frame you want, followed by another Search). The player moves to the indicated frame and stops, displaying that frame until it receives the next instruction.

Chapters may or may not be preprogrammed in the disk, but frame numbers are on all CAV disks and are counted by the player as it runs.

If the disk is a CLV type, the player will know and read search values as minutes of playing time from the beginning of the disk, rather than frame numbers. When the proper location is found, the busy signal stops and normal play mode begins.

The time it takes to reach a frame

Insert these control routines into your program, but don't send any carriage returns or other characters to the player or it will become confused and refuse to cooperate.

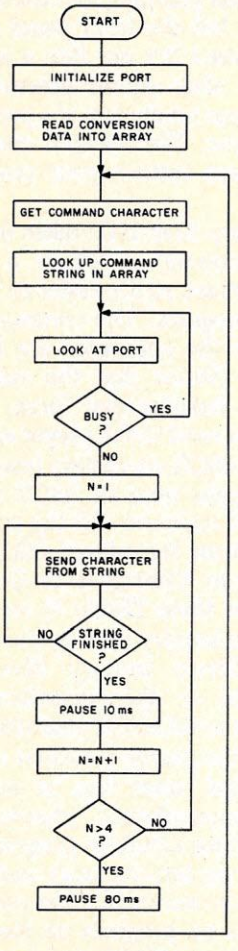


Fig. 4. Control routines for PR8210—flow diagram.

COMMAND	ASCII	HEX CODE	DECIMAL
PLAY (FORWARD)	:	3A	58
PLAY (REVERSE)	J	4A	74
SEARCH	C	43	67
FRAME # MODE	U	55	85
SEGMENT MODE	T	54	84
0	0	30	48
1	1	31	49
2	2	32	50
3	3	33	51
4	4	34	52
5	5	35	53
6	6	36	54
7	7	37	55
8	8	38	56
9	9	39	57
AUDIO 1 ON	F	46	70
AUDIO 1 OFF	G	47	71
AUDIO 2 ON	H	48	72
AUDIO 2 OFF	I	49	73
STEP FORWARD	=	3D	61
STEP REVERSE	M	4D	77
SCAN FORWARD	>	3E	62
SCAN REVERSE	N	4E	78
SLOW FORWARD	<	3C	60
SLOW REVERSE	L	4C	76
FAST FORWARD	;	3B	59
FAST REVERSE	K	4B	75
(no equivalent to PAUSE)			
MOTOR OFF (end of pgm)	c	63	99
(for following commands, no equivalent on PR8210)			
MOTOR ON (only)	b	62	98
STILL	O	4F	79
CONTINUE (after STILL)	a	61	97
INDEX ON (display)	P	50	80
INDEX OFF	Q	51	81
ADDRESS INQUIRY (rev.accent)		60	96
STATUS INQUIRY	g	67	103
DISC I.D. INQUIRY	h	68	104
(following commands for memory programs)			
PGM (marks instruct.)	W	57	87
ENTER (delimiter)	@	40	64
RUN	X	58	88
STOP (takes time val.)	c	63	99
REPEAT	D	44	68
INT (4 registers) (vert.line)		5D	93
DUMP IN	R	52	82
DUMP OUT	S	53	83

Note: Other commands are available for user, but are of little use for microcomputer control.

Table 3. Sony LDP-1000 commands.

RESPONSE	ASCII	HEX CODE	DECIMAL
ACKNOWLEDGE	(LF)	0A	10
NAK (invalid command)	(VT)	0B	11
COMPLETION (srch,rept)	(SOH)	01	01
PGM END	(EOT)	04	04
NOT TARGET (srch prob.)	(ENQ)	05	05
ERROR (in program)	(STX)	02	02

INQUIRY RESPONSES

```
STATUS INQUIRY (responds with 5 bytes; if bit = 1, flag set):
1st byte:
bit 7: (not used)
bit 6: SEARCH/REPEAT mode on
bit 5: MOTOR OFF
bit 4: Player initialized
bit 3: Lid open
bit 2: (not used)
bit 1: (not used)
bit 0: ERROR (reset with CE (41H) or CL (56H))

2nd byte:
bit 7: (not used)
bit 6: MEMORY SEARCH underway
bit 5: STOP mode
bit 4: DECIMAL mode
bit 3: PROGRAM INPUT (ready for start line number)
bit 2: PROGRAM DISPLAY mode
bit 1: PROGRAM EXECUTING
bit 0: PROGRAM LOAD (ready for load)

3rd byte:
bit 7: PROGRAM mode (set for any of above PROGRAM conditions)
bit 6: NATIVE mode (any mode other than PROGRAM)
bit 5: (not used)
bit 4: (not used)
bit 3: (not used)
bit 2: (not used)
bit 1: (not used)
bit 0: (not used)

4th byte:
bit 7: Waiting for program instruction number
bit 6: NUMBER INPUT mode
bit 5: (not used)
bit 4: SEGMENT mode
bit 3: AUTO STOP (set by stop code on disc)
bit 2: REPEAT mode
bit 1: SEARCH mode
bit 0: NUMBER INPUT (waiting for numbers in any mode)

5th byte:
bit 7: DIRECTION (0 = forward, 1 = reverse)
bit 6: (not used)
bit 5: STOP
bit 4: SCAN
bit 3: STEP
bit 2: SLOW
bit 1: FAST
bit 0: PLAY

ADDRESS INQUIRY (responds with 5 ASCII characters = frame number)

DISC I.D. INQUIRY (responds with 40 ASCII characters, or NAK):
        example:

                SONY-DISC-#37:EJ:456:300:42565;
        Title-------|  |  |  |  |
        Language-------|  |  |  |
        Product code-------|  |  |
        Beginning frame-------|  |
        Ending frame-------------|
```

Table 4. Sony LDP-1000 response codes.

Listing 1. Control routines for PR8210—Apple Pascal (program furnished by Pioneer).

```
'1':S:='@N@@NTN@';
'2':S:='@N@TNTN@';
'3':S:='@N@@@N@N';
'4':S:='@N@N@TN@';
```

More

depends on how far away it is. The PR8210 searches at a rate of 3600 frames per second and then takes about one second to settle on the frame. So a search can take from one to 15 seconds. It can step one frame forward or backward immediately, however.

If the blank screen during a search bothers you, display something on the computer screen to grab viewers' attention. It's also possible to have both your computer and the disk player connected to the same monitor with some kind of software-controlled switch or a video merging device so that you see only one display. Check out the popular video magazines for this.

Listing 3 is an example of a control program to show various parts of the Space Shuttle disk mentioned earlier. Notice that the user doesn't type frame numbers but simply responds to the menus.

Since there is no feedback to the computer about the current frame number, any operation of the player controls may put your program out of sync. (The infrared controller is disabled when you plug into the Ext Control jack, but the front panel controls still operate.) It's not like a multiple-projector slide show, however, that can become totally lost if a projector is out of sync. Your search commands will always restore your position in the disk.

The Sony LDP-1000 takes one-character command codes in a normal ASCII format, so it's easier to write its control program. The commands you use from the computer are listed in Table 3. Notice that the values are given in hexadecimal form. All the codes you send to the player are in the range of ASCII characters from 0 to h. For example, send an ASCII f to turn channel 1 audio on. All the codes you receive from the player fall into the group from Control-A to Control-K, except for those (Table 4) responding to a status inquiry (five bytes of binary data), address inquiry (five ASCII characters) or disk identification inquiry (up to 40 ASCII characters).

When the player is turned on and a disk loaded, send Run to start. The player immediately checks audio channel 2 for a built-in program, reads the program into memory and follows it, unless it receives a Clear command. If there is no program on the disk, it goes to frame 00001 and begins normal play mode.

To search for a particular frame,

send Search, then up to a five-digit number and Enter. If the disk has preprogrammed segments (chapters), you can search for a segment by sending Segment Mode after the Search command. (To return to frame search mode, send Frame # Mode after Search.) When the frame or segment is reached, the player begins normal run mode unless Still command is received (CAV disks only).

To step to the next frame, send F-Step, delay 75 to 100 ms, then send Still.

Slow speed play is controlled anywhere between normal speed and 1/255 of normal speed (8.5 seconds per frame). Fast play can be either three times normal or approximately 100 times normal (Scan). Programmed segments are repeated up to 15 times with a single instruction.

To program a segment, send Segment, a number from 1 to 63, Enter and then two numbers representing the beginning and ending frame numbers, each followed by Enter.

If the disk contains a control program, access it through the computer port after the player reads it into memory, then change it and send it back. (The disk itself cannot be reprogrammed, naturally, but the program is executed from player memory.) This is handy if a routine repeats itself frequently in your program—it can be stored in player memory and called with the PGM command. If you load the program in the beginning, it doesn't take up memory space in your computer during operation. The latest model LDP-1000A has 5Kb of memory and room for 512 lines or separate instructions.

The separate program lines can be accessed, executed or changed independently. Your computer can be busy doing other things and simply monitor the player port for a signal that the operation or programmed instruction is completed. The possibilities are practically endless.

The Status Inquiry command results in five bytes of information being returned from the player (Table 4). Since most commands are executed when received, the status bytes can be checked to make sure the previous instruction was carried out before a new one is issued.

To decode a status byte, mask out the bit you're interested in. Suppose you want to check to see if the player is running from the internal program. In the second byte returned after a

Listing 1 continued.

```
            '5':S:='@N@@TN@N';
            '6':S:='@N@TTN@N';
            '7':S:='@N@@@@TN@';
            '8':S:='@N@NTTN@';
            '9':S:='@N@@N@@N';
            '"':S:='@N@@TTNN;                    (* AUDIO 2 *)
            '!':S:='@N@TTTNN;                    (* AUDIO 1 *)
            '.':S:='@N@N@NN;                     (* STEP FORWARD *)
            ',':S:='@N@@N@N@;                    (* STEP REVERSE *)
            'L':S:='@N@TNNN;                     (* SCAN FORWARD *)
            'K':S:='@N@@@@NN;                    (* SCAN REVERSE *)
            'X':S:='@N@@@NN@;                    (* SLOW FORWARD *)
            'Z':S:='@N@NTNN;                     (* SLOW REVERSE *)
            'J':S:='@N@@NNN;                     (* FAST FORWARD *)
            'H':S:='@N@TTNN@;                    (* FAST REVERSE *)
            'V':S:='@N@TN@N@;                    (* PAUSE *)
            'R':S:='@N@@@@@N@;                   (* REJECT *)
      END;

    FOR I:=1 TO LENGTH(S) DO BEGIN
      IF S[I]='T' THEN S[I]:=CHR(126);
                                  (* TRANSLATES T'S TO TILDES *)
      END;

      WRITE(OUTF,S);
      FOR K:=1 TO 9 DO BEGIN END;              (* 10 MS DELAY *)
      WRITE(OUTF,S);
      FOR K:=1 TO L DO BEGIN END;              (* 75 MS DELAY *)

    END;
    WRITELN('OUTPUT DONE');
    UNTIL SS=' ';

    CLOSE(OUTF);
    WRITELN('FILE CLOSED');
    END.
```

Note: This program is from Pioneer Laserdisc(R) Application Note #130, dated 19 Jan. 1983.

Listing 2. Control routines for PR8210-Heath B.H. Basic.

```
100 REM                    TYPEOUT.BAS
110 REM          EXTENDED BENTON HARBOR BASIC
120 REM       ADAPTED FROM PASCAL VERSION FIGURE 5.
130 REM
140 DIM B1(11),B2(11),B3(11),C1$(26),C2$(26)
150 P = 330:      REM   PORT NUMBER
160 B = 4800:     REM   BAUD RATE
499 :
500 REM  INITIALIZE PORT (8250 ACE ON 4-PORT SERIAL BOARD)
510 FOR X = 1 TO 11: READ B1(X),B2(X),B3(X): NEXT X
520 FOR X = 1 TO 11: B1 = B1(X)
530 IF B1 = B GOTO 560
540 NEXT X
550 PRINT "INVALID BAUD RATE AT LINE 150":END
555 :
560 OUT P+3,128:  REM   ACCESS BAUD RATE GENERATOR
570 OUT P, B2(X)
580 OUT P+1, B3(X)
590 OUT P+3, 6:   REM   7-BIT WORDS, 2 STOP BITS, NO PARITY
599 :
600 DATA 75,0,6,110,23,4,134.5,89,3,150,0,3,300,128,1
610 DATA 600,192,0,1200,96,0,2400,48,0,4800,24,0
620 DATA 9600,12,0,19200,6,0
699 :
700 REM  CONVERT COMMAND CHARACTER AND OUTPUT STRING
705 FOR X = 1 TO 26
710 READ C1$(X),C2$(X): NEXT X
715 GOTO 1000
720 FOR X = 1 TO 26: C1$ = C1$(X)
725 IF C1$ = C$ GOTO 800
730 NEXT X
735 PRINT "INVALID COMMAND CHARACTER": GOTO 180
740 :
750 REM              CODES SAME AS PASCAL VERSION EXCEPT AUDIO 2
759 :
760 DATA "P","NTNN"
761 DATA "S","NTNN"
762 DATA "F","NTNN"
763 DATA "C","NNN"
764 DATA "0","NNNN"
765 DATA "1","NNTN"
766 DATA "2","NTNTN"
767 DATA "3","NNN"
768 DATA "4","NNTN"
```

More

Listing 2 continued.

```
769 DATA "5","NTNN"
770 DATA "6","NTTNN"
771 DATA "7","NTN"
772 DATA "8","NNTTN"
773 DATA "9","NNN"
774 DATA "'","NTTNN"
775 DATA "!","NTTTNN"
776 DATA ".","NNNN"
777 DATA ",","NNN"
778 DATA "L","NTNNN"
779 DATA "K","NNN"
780 DATA "X","NNN"
781 DATA "Z","NNTNN"
782 DATA "J","NNNN"
783 DATA "H","NTTNN"
784 DATA "V","NTNN"
785 DATA "R","NN"
799 :
800 REM   SEND STRING TO PORT
810 I = PIN(P+5):          REM   CHECK LINE STATUS REGISTER
820 I = I AND 16:          REM   LOOK AT BREAK INDICATOR
830 IF I = 16 GOTO 810:    REM   HAVE BUSY SIGNAL - LOOP BACK
835 FOR N = 1 TO 4:        REM   NEED FOUR IDENTICAL
840 FOR Y = 1 TO LEN(C2$(X))
850 C = ASC(MID$(C2$(X),Y,1))
860 IF C = 84 THEN C = 126:  REM   CHANGE "T" TO TILDE
870 OUT P,C
880 PAUSE(5):   REM    10 MS DELAY - ADJUST IF NECESSARY
890 NEXT Y
900 NEXT N
920 PAUSE(40):   REM    80 MS DELAY - ADJUST IF NECESSARY
930 RETURN
999 :
1000 REM   MAIN PART OF PROGRAM - THIS IS WRITTEN TO TEST THE
1010 REM   FUNCTION OF THE OUTPUT ROUTINES BY TAKING COMMANDS
1020 REM   ONE AT A TIME FROM THE CONSOLE.  (ENTER "*" TO END
1025 REM   SESSION.)
1030 REM   AFTER TESTING, REPLACE THIS WITH YOUR OWN PROGRAM.
1040 REM   JUST BEFORE THE GOSUB 720, C$ MUST CONTAIN COMMAND
1050 REM   CHARACTER TO BE OUTPUT.
1055 :
1060 INPUT "NEXT COMMAND CHARACTER: ";C$
1070 IF C$="*" THEN END
1080 GOSUB 720
1090 GOTO 1060
```

Status Inquiry command, bit number 1 will be high if the player is, indeed, executing the internal program (see Listing 4).

These and other functions of the Sony player give you more control than the Pioneer PR8210 does. You can even check the disk identification to branch to separate subprograms so that you can simply insert a disk, press return on the computer keyboard (or a special start button) and the rest is automatic.

Much more can be done with the available commands for either player, but I've tried to give enough examples to show you the technique. Once you've managed to control the player with the basic routine, your application programs can be as elaborate as your imagination.

If you have a different videodisk player, you may be able to control it with some modifications of these routines. If you have a Pioneer VP1000, you need some hardware to generate the 38 KHz signal—Steve Ciarcia designed a little interface device to do that (published in the June 1982 *BYTE* magazine).

With any interactive player and existing videodisks, you can expand the possibilities of your microcomputer, whether it is a 128Kb 16-bit machine or a little portable with 8Kb of memory and a one-line display.■

Listing 3. Sample program for PR8210 control.

```
1000 REM     SAMPLE CONTROL PROGRAM (INSERT IN FIGURE 7)
1005 :
1010 C$ = "P": GOSUB 3000:  REM      START THE PLAYER
1020 PAUSE(500):  REM                WAIT FOR BUSY SIGNAL
1030 C$ = "S": GOSUB 3000:  REM      SEARCH COMMAND
1040 C$ = "F": GOSUB 3000:  REM      FRAME COMMAND
1050 C$ = "1235": GOSUB 3000:  REM   FRAME NUMBER
1060 C$ = "S": GOSUB 3000:  REM      END OF SEARCH
1070 FOR N=1 TO 4:PAUSE(25250):NEXT N:REM  PLAY 202 SECONDS
1080 C$ = "V": GOSUB 3000:  REM      PAUSE AT END
1090 INPUT "Do you want to see the launch again? (Y/N) ";R$
1100 IF LEFT$(R$,1) = "Y" OR LEFT$(R$,1) = "y" GOTO 1030
1110 C$ = "SF": GOSUB 3000:  REM     SOME COMMANDS CAN BE GROUPED
1120 C$ = "964": GOSUB 3000
1130 C$ = "S": GOSUB 3000
1140 C$ = ".": GOSUB 3000:  REM      STEP COMMAND FREEZES FRAME
1150 FOR M = 1 TO 12
1160 C$ = ".": GOSUB 3000:  REM      STEP THROUGH 12 STILLS
1170 PAUSE(2500):  REM               HOLD EACH FRAME 5 SECONDS
1180 NEXT M
1190 PRINT "Read Pages 6-10, then press RETURN."
1200 PAUSE
1210 PRINT:PRINT "Select one of the following by typing its number,"
1220 PRINT "then press RETURN."
1230 PRINT:PRINT TAB(8);"1.  Crew activities in space (10 minutes)"
1240 PRINT TAB(8);"2.  Return of Shuttle to Earth."
1250 PRINT TAB(8);"3.  Stop the player."
1260 INPUT R: ON R GOTO 1300,1400,1500
1270 PRINT:PRINT "PLEASE SELECT  1, 2, OR 3, THEN PRESS RETURN. "
1280 GOTO 1260
1299 :
1300 REM          CHAPTER 4 - CREW ACTIVITIES
1310 C$ = "SC4S": GOSUB 3000:  REM   CHAPTER SEARCH
1320 FOR N=1 TO 12:PAUSE(26147):NEXT N:REM  PLAY FOR 10.459 SEC.
1330 C$ = "V": GOSUB 3000:  REM      PAUSE COMMAND TURNS OFF PICTURE
1340 GOTO 1210
1399 :
1400 REM          CHAPTER 6 - RE-ENTRY OF SHUTTLE
1410 C$ = "SC6S": GOSUB 3000
```

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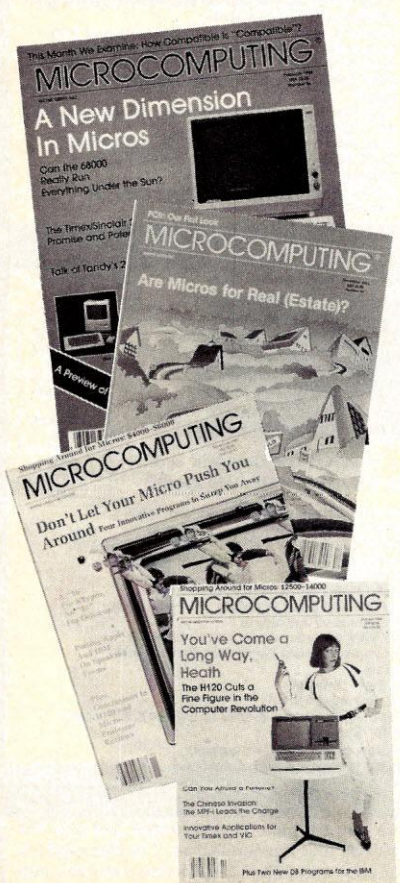
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Listing 3 continued.

```
1420 FOR N=1 TO 2:PAUSE(24500):NEXT N:REM  PLAY FOR 98 SECONDS
1430 C$ = "V": GOSUB 3000
1440 GOTO 1210
1499 :
1500 REM              SYSTEM SHUTDOWN
1510 C$ = "R": GOSUB 3000:  REM      REJECT COMMAND STOPS PLAYER
1520 PRINT "To begin the Space Shuttle lesson, turn on player power,"
1530 PRINT "then type RUN and press RETURN."
1540 END
1599 :
3000 REM   ROUTINE TO BREAK DOWN FRAME OR CHAPTER NUMBERS
3010 :
3020 IF LEN(C$) = 1 THEN GOSUB 720: RETURN
3030 C3$ = C$
3040 FOR Z = 1 TO LEN(C3$)
3050 C$ = MID$(C3$,Z,1)
3060 GOSUB 720
3070 NEXT Z
3080 RETURN
```

```
PROGRAM   TYPEOUT;

(* THIS PROGRAM IS IN THE APPLE PASCAL LANGUAGE, AND IS
   PROVIDED HERE SIMPLY AS AN INDICATION OF THE TYPE OF
   CODING A CUSTOMER WOULD NEED TO DO TO CONTROL THE PR8210
   PLAYER.  IT IS NOT IN ANY WAY GUARANTEED, BUT MAY BE
   OF USE TO SOME CUSTOMERS.  THE PROGRAM WAS INTENDED TO
   USE THE APPLE SUPER SERIAL CARD.  BUT MANY OTHER SERIAL
   INTERFACES COULD BE USED.  *)

VAR  S,SS,SSS:STRING;
     II,L,I,J,K: INTEGER;
     CTLA: STRING;
     OUTF: INTERACTIVE;

BEGIN                          (* FIRST SOME INITIALIZATION *)
 CTLA:=' ';
 CTLA[1]:=CHR(1);                        (* SOH = CONTROL A *)

 RESET(OUTF,'REMOUT:');

 WRITELN(OUTF,CTLA,'12B');                    (* 4800 BAUD *)
 WRITELN(OUTF,CTLA,'5D');                  (* 7 DATA 2 STOP *)
 WRITELN(OUTF,CTLA,'0P');                     (* NO PARITY *)

 WRITELN('ENTER WAIT FACTOR');
 READLN(L);     (* USE L=75 AS A TYPICAL VALUE, 75MS WAIT *)

       (* THEN THE HEART OF THE PROGRAM *)

REPEAT
  WRITELN('ENTER STRING');
  READLN(SS);      (* HERE ENTER ONE-CHARACTER ABBREVIATIONS
                   FROM THE CASES BELOW, ONE SPACE TO QUIT *)

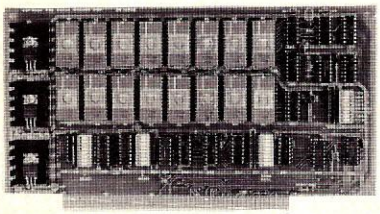
  FOR II:=1 TO LENGTH(SS)  DO BEGIN
        S:='@N@NNNT';                    (* NULL COMMAND DEFAULT*)
    CASE SS[II] OF
        'P':S:='@N@@TNN@';               (* PLAY *)
        'S':S:='@N@@@TNN';               (* SEARCH *)
        'F':S:='@N@TN@@N';               (* FRAME *)
        'C':S:='@N@N@NN@';               (* CHAPTER *)
        '0':S:='@N@NN@N';

0250 GOSUB 1000:     REM   TIME TO CHECK STATUS
...
1000 REM   CHECK FOR PLAYER PROGRAM RUNNING
1010 :
1020 OUT P, 103:     REM   103 = "g", STATUS INQUIRY
1030 C = PIN(P+5):   REM   WATCH PORT FOR RESPONSE
1040 IF C AND 1 <> 1 THEN 1030: REM  LOOP UNTIL RESPONSE
1050 C = PIN(P):     REM   GET FIRST BYTE FROM PLAYER PORT
1060 C = PIN(P):     REM   GET SECOND STATUS BYTE.
1070 FOR N = 1 TO 3: REM   GET THE REST OF THE BYTES, JUST
1080 D = PIN(P):     REM   TO CLEAR THE PORT.
1090 NEXT N:         REM   WE DON'T HAVE TO USE THEM.
1100 C = C AND 2:    REM   THE "AND" FUNCTION LEAVES ONLY
1110 REM                   THE BIT YOU'RE INTERESTED IN.
1120 REM                   2 = BINARY 00000010 (BIT 1 MASK)
1130 IF C <> 2 THEN RETURN: REM  IF THE BIT IS NOT HIGH,
1140 REM                   THE RESULT DOESN'T MATCH THE MASK.
1150 PAUSE(500):     REM   IF IT DOES, WAIT ONE SECOND, THEN
1160 GOTO 1000:      REM   GO BACK AND TRY AGAIN.
```

Listing 4. Program listing for decoding status bytes.

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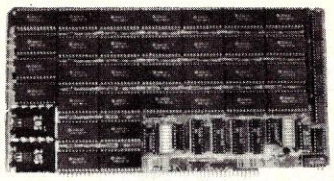
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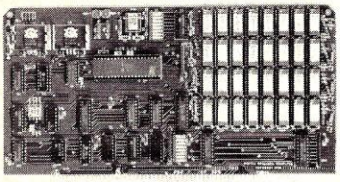


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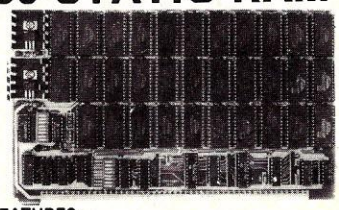
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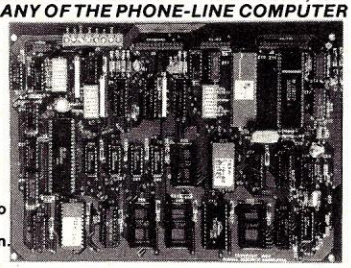


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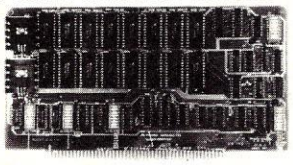
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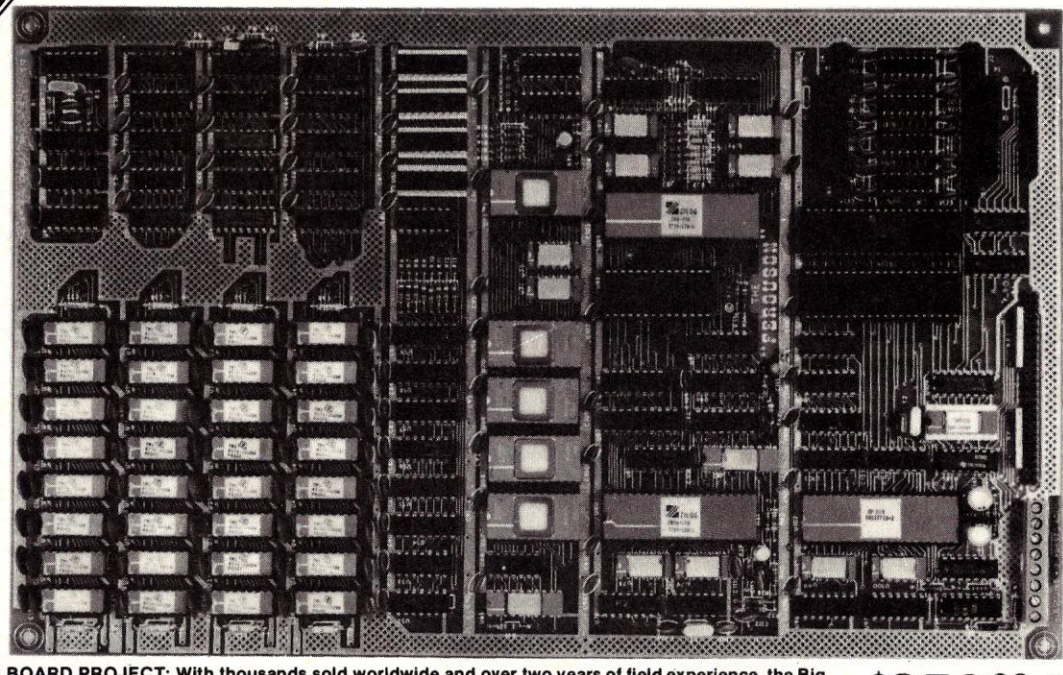
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Catch the IEEE-488 Bus

The IEEE-488 bus has gained notoriety over the past few years and this article explains why. It also focuses on some possible uses for this fascinating little bus.

By Peter Baum

In the past few years the expression IEEE-488 has been creeping into the vocabulary of the microcomputer world. More and more personal computer and peripheral manufacturers are advertising their equipment as IEEE-488 bus compatible. This article gives a brief overview of the IEEE-488 bus standard and, with a few examples, examines how the bus can be used with personal computers.

The formal name for the bus, as defined by IEEE Std 488-1978, is the IEEE Standard Digital Interface for Programmable Instrumentation. The bus is also called the General Purpose Interface Bus (GPIB) and the Hewlett-Packard Interface Bus (HP-IB). These terms—IEEE-488 bus, GPIB and HP-IB—are used interchangeably here.

An Overview of the IEEE-488 Bus

- Standard, plug compatible, I/O bus
- Maximum of 15 devices on bus
- Maximum of 20 meters of cable between all instruments on bus
- At least one device for every two meters of cable
- Byte-serial, bit-parallel, asynchronous data transfer
- 250 kilobyte typical maximum data transfer rate
- Interrupt capabilities (service request)
- Block data transfer capability

The GPIB standard was designed to arbitrate the communication between multiple instruments on a single data bus. It was also designed for systems whose instruments are relatively close together, such as work stations. So although up to 15 devices can be hooked to the bus at the same time, there is a limit of 20 meters overall transmission path lengths.

The bus network can be either daisychained (linear) or in a star (parallel) configuration. There must also be at least one device for every two meters of cable on the bus. The cable length between adjacent devices is not critical as long as the total accumulated cable length is less than two meters times the number of devices connected to the bus (and the total length is less than 20 meters). The IEEE-488 bus configuration shown in Fig. 1 is a workable example.

The bus cable consists of 24 conductors of which 16 are used for active signal lines and the balance used for logic grounds and overall shield. The cable, connectors and pinouts are defined in the mechanical specifications of the standard. The commercially available IEEE-488 cables typically have connectors with both a male and female connection on each end so that the cables can be piggybacked.

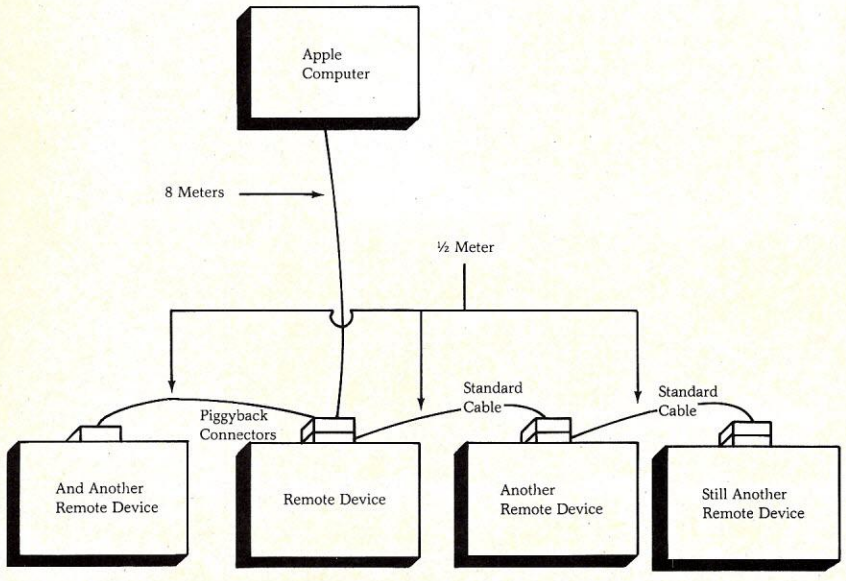


Fig. 1. One possible GPIB configuration. This would use a total of 9.5 meters of cable divided among five instruments, which is less than two meters of cable per instrument.

Address correspondence to Peter Baum, Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014.

The 16 active signal lines can be broken into three different groups: the data/command lines, the handshake lines and the management control lines. The electrical and functional specifications of these signals are defined in the standard. The operational aspects of the standard are left to the instrument designer; this enables the designer to customize the device to do needed functions. The implementation of these functions, within certain bounds, is also decided by the designer.

There are eight data/command lines. These signals have the dual purpose of sending data and commands. When used to send data, these signals represent an eight-bit bidirectional path used for transferring ASCII or binary data. When the ATN management control line is asserted, these data lines are used to send commands over the bus. These commands include device addresses, status, control bytes and device dependent data.

Three of the signal lines are used for handshaking during data or command transfer over the bus. These transfer control lines are used to send bytes over the bus asynchronously. This means that the bus waits for the slowest active device involved in the transfer to accept data before proceeding.

The bus can transfer at a maximum of 250Kb per second if open collector drivers are used, 500Kb per second maximum if three-state drivers are used, and can achieve faster data rates if certain guidelines described in the standard are used. The short transmission path of the bus (less than 20 meters) contributes to the fast data rate. Since the bus runs at the rate of the slowest active device, the bus can only transfer data at the maximum rate if all devices involved in the transfer are capable of attaining that rate.

The five management control lines are typically used to send certain control commands. One of these lines, SRQ (service request), is used by devices to request service. This line can be used to generate an interruption of the system or current sequence of events.

Another management line, ATN (attention), is used to dictate whether the bytes sent on the data lines should be interpreted as commands or data. The IFC (interface clear) line is used to force the bus to a known state and can also be used to stop the bus from functioning.

REN (remote enable) is used to enable instruments so that they can be programmed from the bus instead of the front panel. The last control line, EOI (end or identify), is used to indicate the end of a data transfer sequence and, in conjunction with ATN, to find which devices may be requesting service.

The bus has three fundamental roles in organizing and managing the flow of information between devices: Talker, Listener and Controller.

A Listener receives device-dependent data from another device (the Talker) on the bus. There can be more than one listener on the bus at the same time (up to 14). Examples are printers, plotters and other display devices.

A Talker transmits device-dependent data to one or more Listeners on the bus; only one active Talker can be on the bus at a time. An example of this is a voltmeter or a counter.

A Controller is used to specify which devices should talk or listen. It can also send interface control messages. A Controller can also act as a Talker and Listener, but does not require these functions; if they can't be implemented the Controller can't send or receive device-dependent messages. Only one Controller can be in charge at any one time, but more than one Controller can be on the system. One Controller is designated as the System Controller and it selects which Controller will be the active Controller at a given time.

A device can have any combination of these three functions. For example, a disk drive is typically both a Talker and Listener, while a computer might be all three: Talker, Listener and Controller.

The standard defines a method by which a device can request service from the controller. The controller must determine which device or devices are requesting service. The standard defines two methods, known as polling, to do this. Using one of these polling techniques, the controller can also determine the type of request or status information from the device.

Bus Protocol

The GPIB standard defines two different types of messages that can be sent—uniline and multiline. The uniline message is sent over one of the management control lines (ATN, REN, EOI, SRQ, IFC) or one of the handshake lines. Multiline messages are transferred using the data bus.

Four types of commands are sent over the IEEE-488 bus: addresses, addressed commands, universal commands and secondary commands.

Addresses are used by the bus to select the devices that will respond to data/commands on the bus. Every device on the bus will, typically, respond to a single unique address. This address is usually designated by switches on the instrument and can be changed so that each device has a unique address. Some instruments may recognize more than one address from the bus, in which case each address may designate a specific function within the instrument. When the Controller sends out an address, it specifies whether the device with that address should listen or talk on the bus.

Addressed commands are performed only by those devices addressed to listen. An example of an addressed command is Selected Device Clear, which requires an addressed device to go into a known fixed state (typically specified in the instrument's operation manual). In this case, the Controller specifies selected devices to perform Device Clear by sending their addresses, followed by the Selected Device Clear command.

Universal commands are similar to addressed commands, except they are used to instruct all instruments on the bus to execute a specific interface function. All devices on the bus should perform the function if they are capable of implementing it. The universal command of Device Clear requires all instruments to perform a device clear.

Secondary commands are used to provide additional command codes. They can be used to extend the possible number of valid addresses or commands when necessary.

When a device is selected to be a Talker, it will remain a Talker until either the Untalk command is sent or another instrument is addressed to talk (since there can be only one device talking on the bus at a given time).

Selecting another instrument to listen will not cause any listener to unlisten. Only the Unlisten command can deselect a listener, at which time all listeners are deselected and will no longer be listeners.

Let me give an example to illustrate the use of the data transfer scheme.

The Controller specifies a data transfer by first sending the Unlisten command to clear the bus of all listeners. The next command bytes specify which device is to talk and which device(s) will listen. This would require one byte to be sent on the bus for each Listener and one more to specify the Talker.

After the Controller sets the ATN line false, the Talker can send as many bytes as it requires to complete the data transfer. These bytes can be sent as fast as the slowest active device (Talker or Listener) will permit. This mode of operation permits blocks of data to be transferred with minimal overhead.

Using the Bus With Personal Computers

The IEEE-488 standard was originally intended for use in laboratory and production test environments. An estimated 2000 types of instruments with the IEEE-488 interface are in use. Many of these were designed with the standard's original intent in mind. These instruments, such as spectral analyzers, signal generators and automated calibration systems, are not the type of instruments typically found in the home. But recently products such as printers, plotters, and floppy and hard disk drives have been designed with IEEE-488 interfaces. This trend of manufacturing instruments with the IEEE-488 interface will continue in the future.

Designing an instrument that would connect to the GPIB used to require a separate circuit board just for the components that implemented the bus standard. This board could require as many as 50 integrated circuits and would sometimes be as large as the rest of the components required for the instrument. The extra cost required to supply the IEEE-488 interface usually relegated it to being a high-priced option for the instrument.

This no longer has to be true. In the past few years at least six manufacturers have designed integrated circuits that implement selected functions of the standard. These chips vastly simplify incorporating an IEEE-488 interface into an instrument. Today, an IEEE-488 interface can be designed into an instrument using less than 2.5 square inches of board space. This lowers the cost of the interface and should lead more companies to incorporate it into their products.

Since the IEEE-488 bus is a standard, users will not have to buy a new interface card when upgrading their peripherals (e.g., a larger disk, a faster printer). A single IEEE-488 interface card would work with both old and new devices.

My second example takes place in an office where certain resources, such as printers or disks, could be shared among several workers. In this case each Apple in the office would be equipped with an Apple IEEE-488 interface card.

These Apples would then be connected together and to a single printer and/or disk drive through the IEEE—488 bus. (Remember, there can be no more than 20 meters of cable between all of them and no more than 15 total instruments.) One Apple would then be designated the System Controller and the rest would just act as devices on the bus.

When one of the "device" Apples wants to send information to the printer, it signals the System Controller by turning the SRQ line on. The System Controller then initiates a serial poll to find which device was requesting service. When the requesting device is polled, it responds with a predefined code that tells the Controller that it wants to send data to the printer. The Controller would then address the requesting Apple to be a Talker and address the printer to be a Listener. Data could then be transferred to the printer.

This example, like the first, has multiple devices on the same bus. In addition, this system can handle computer-to-computer data transfers. This local network could be used to send data back and forth at burst rates as high as 50Kb per second.

The proliferation of GPIB compatible instruments will help the personal computer user. Let me demonstrate this with a couple of scenarios, using the Apple computer.

The first example involves an Apple computer in the home. As prices decline in the future, a home user might wish to connect the computer to all of the following devices: a hard disk, a printer, a plotter, a modem, a voice recognition and synthesis interface, a back-up device for the hard disk (floppy, cassette or tape drive), a real-time clock, an 80-column card and a RAM expansion card.

These devices cannot all be connected to the Apple without an expansion chassis. Even if all the peripherals can be connected, each device still requires its own interface card. In some cases (80-column, RAM expansion, real-time clock) the interface card is all that is required. In others (disks, printer, plotter), a custom interface card must be bought for the Apple.

Instead of an expansion chassis and the custom interfaces for the Apple, a single peripheral card, the Apple IEEE-488 interface card, can be used. This card connects to the Apple and acts as a Controller on the IEEE-488 bus. The hard disk, printer, plotter, modem, voice recognition and synthesis, and a floppy disk or tape drive can then all be hooked to the GPIB. This eliminates the need for the expansion chassis and the custom parallel and serial cards used by the Apple to communicate with the disks, printers, and so on.

The instruments communicate asynchronously using a parallel data transfer so that the fast devices, such as disks drives, can go fast, and the slow devices, such as printers, can go slow.

These two examples illustrate how the IEEE-488 bus can be used as a standard personal computer input/output bus. Instruments that the personal computer user needs are now becoming available with GPIB interfaces at affordable prices, because the peripheral manufacturers realize there are advantages to the IEEE-488 bus: parallel, asynchronous, block data transfers, multiple devices, and more.

As more personal computer manufacturers realize this, they will begin to include the IEEE-488 bus in their future products as the standard parallel I/O bus.■

References

IEEE Standard 488-1978, "Digital Interface for Programmable Instrumentation," The IEEE, INC., 345 East 47th St., New York, NY 10017, Nov. 1978.

Apple II IEEE-488 Interface User's Guide, Apple Computer, Inc., 10260 Bandley Drive, Cupertino, CA 95014, 1981 PN-030-0197-A.

Tutorial Description of the Hewlett-Packard Interface Bus. Hewlett-Packard, Nov. 1980, PN-59300-90007.

Bert Forbes, "IEEE-488: A Proposed Microcomputer I/O Bus Standard," *Computer Design*, Nov. 1978 issue. Also Ziatech Corp., 2410 Broad St., San Luis Obispo, CA 93401.

CALENDAR

IBM User's Group Conference—OH

Cincinnati, OH is the site of this year's spring conference of Common, a worldwide IBM user's group. The conference, scheduled for April 1–5, will feature almost 200 presentations covering state-of-the-art IBM topics.

Special management sessions will be presented by Northwestern University. For more information about either Common or the spring conference, contact David Lister, administrative director, Common, 435 N. Michigan Ave., Suite 1717, Chicago, IL 60611; 312-644-0828.

Voice Synthesis Show—New York

Speech Tech '84, billed as the first voice synthesis and recognition applications show, is scheduled for April 2–4 at the St. Moritz Hotel in New York City.

The show will address voice input/output technology and a variety of applications, including telecommunications and robotics.

Speech Tech will feature a complete voice communications environment to provide participants with hands-on demonstrations. For more information, contact Stanley Goldstein, publisher, Media Dimensions, Inc., 525 E. 82nd St., New York, NY 10028; 212-680-6451.

Microelectronics in Germany

The 1984 Hannover Fair will be held April 4–11 in Hannover, West Germany. The event will focus on innovations and new applications in microelectronics.

The newly expanded Center for Microelectronics will be divided into seven display groups, including new products, microcomputer development systems, microcomputer software and microcomputer boards.

The fair will also feature lectures, seminars and an exhibition featuring products from more than 6000 companies. For more information, contact Delia Associates, PO Box 338, Whitehouse, NJ 08888; 800-526-5978, or from within New Jersey, 201-534-9044.

Do Kids Love Computers?

The University of Delaware is sponsoring a conference on computers and young children on April 5 and 6. The program is aimed at teachers, administrators and researchers and will feature speakers from the Children's Television Workshop. A computer show will follow the conference.

For more information, contact Richard Fischer, Division of Continuing Education, University of Delaware, Newark, DE 19716; 302-451-1171.

Comdex Again?

The first winter version of the famous, and infamous, Comdex shows, Comdex/Winter, is slated for April 5–7 in Los Angeles, CA. As a welcome addition to the festivities, the exhibition floor will be divided into two categories: hardware and software.

Thirty-five sessions will be offered on business, marketing and financial subjects. For more information, contact the Interface Group, Inc., 300 First Ave., Needham, MA 02194; 800-325-3330, or from within Massachusetts, 617-449-6600.

Showcase Expos Abound

Three Computer Showcase Expos are slated for this month around the country. The expos are geared toward business, professional and corporate users of micros and word processors. At each show, the Small Computer College will offer seminars at no additional cost.

April 5–8, the expos will be in South Florida at the Miami Beach Convention Center. April 12–15, the show travels to St. Louis and the AJ Cervantes Convention Center. San Diego is the final stop of the month—the show will be at the San Diego Convention and Performing Arts Center April 26–29. For more information on any of the shows, contact Linda Yogel or Peter B. Yound at The Interface Group, Inc., 300 First Ave., Needham, MA 02194; 800-325-3330, or from within Massachusetts, 617-449-6600.

Computers in Education—Philadelphia

On April 7 and 8, Philadelphia, PA will host the Second Annual Eastern States Conference: Computers in Reading/Learning Disabilities. In addition to the main conference, participants will have the opportunity to informally meet and share ideas on the role of computers in learning disabilities.

Special discount rates are available for school districts. Write to the Educational Computer Conference, Dept. N, 1070 Crows Nest Way, Richmond, CA 94803.

Online in New York

The Fifth Annual National Online Meeting will be held in New York City at the Sheraton Centre Hotel April 10–12.

The meeting will feature papers, product review sessions and an exhibition. Papers will cover selection of equipment and software for minis and micros, among other topics.

For more details, contact the National Online Meeting, Learned Information, Inc., 143 Old Marlton Pike, Medford, NJ 08055; 609-654-6266.

Teleconferencing Symposium in the Capital

AT&T Communications and the George Washington University Center for Telecommunications Studies are sponsoring a program on teleconferencing April 11 and 12 at the Washington Hilton Hotel.

The Global Teleconferencing Symposium will focus on using teleconferencing as a tool to increase productivity. Sessions are scheduled to address national and international teleconferencing strategies; many presentations will be made via teleconferencing.

Several noted speakers and an exhibition will round out the event. For more information, contact National Trade Productions, Inc., 9418 Annapolis Road, Lanham, MD 20706; 301-459-8383 or 800-638-8510.

Micros, College and The Big Apple

On April 13–15, the Instructional Resource Center of The City University of New York will sponsor a national conference, Microcomputers and Basic Skills in College.

Papers will be presented addressing the use of micros in post-secondary education, including reading, writing, mathematics and English as a second language.

The conference is to be held at the Vista Hotel in New York City. For more information, contact Geoffrey Akst, conference chairman, Instructional Resource Center, The City University of New York, 535 East 80th St., New York, NY 10021; 212-794-5425.

New Jersey Computer Festival

Trenton, NJ will host its Ninth Annual Computer Festival April 14 and 15 at Trenton State College. The conference, sponsored by several users groups, features an outdoor flea market, an exhibition, forums and a computer games contest.

Short courses and day care facilities are available to the public. A banquet on April 14 will round out the festivities. For more information, contact Marilyn Hughes, Trenton State College, Hillwood Lakes, CN 550, Trenton, NJ 08625; 609-771-2487.

IIE Conference Series Continues

The IIE will continue its lecture series this month with a robotics conference April 16–18.

Robotics—Equipment, Applications and Methodology will be held at the IIE Educational Center in Norcross, GA. The conference is also scheduled to be repeated in June. For registration information, contact the IIE Conference Department at 25 Technology Park/Atlanta, Norcross, GA 30092; 404-449-0460.

Videotex in The Windy City

Videotex '84, an international conference and exhibition, is slated for April 16–18 at the Hyatt Regency Hotel in Chicago, IL.

The conference is geared toward people interested in the latest developments in the videotex industry. In addition to three simultaneous conference sessions, this year's event will also feature "Talk Shops," which offer businesspersons the opportunity to informally exchange ideas and information.

Several key companies are slated to participate in the exhibition. For more information, contact Sally Summers at London Online, Inc., 2 Penn Plaza, Suite 1190, New York, NY 10121; 212-279-8890.

Yankee Seminars Bicoastal

The Yankee Group will host two seminars in April entitled The Home Market—PCs and Video Games.

The seminar is scheduled for April 17 and 18 in New York City and for April 24 and 25 in San Francisco. For more information on either seminar, contact Lisa Caruso, The Yankee Group, 89 Broad St., Boston, MA 02110; 617-542-0100.

Software AG in Anaheim

Software AG of North America, Inc. is sponsoring its Thirteenth Annual International User's Conference in Anaheim, CA from April 19 to May 3.

Guest speakers, workshops and classes will all be available to users of Software AG products. The keynote speaker will be John Naisbitt, a national bestseller author. Product change/enhancement sessions are also slated to keep users up to date on current changes in the company's products.

For more information, contact Tom Blondi, vice president of marketing, at 703-860-5050.

Micros in the Great South

The Great Southern Computer Shows will kick off their spring schedule of events with a show in Columbia, SC April 26–28 at the Carolina Coliseum.

Several computer seminars will complement the extensive exhibit, which includes telecommunications equipment and computer timesharing services along with hardware and software products.

For more information, contact Great Southern Computer Shows at PO Box 665, Jacksonville, FL 32201; 904-356-1044.

NY Computer Show—Long Island

The Third Annual New York Computer Show is scheduled for April 26–29, 1984 at the Nassau Coliseum in Uniondale, Long Island.

Manufacturers, distributors and dealers will display their micros, peripherals, accessories and services. For more information, contact Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167; 617-739-2000.

Whiz Kid Alert

The Fourth Annual International Computer Problem Solving Contest will be held on Saturday, April 28. The contest is designed to provide students from around the world with the opportunity to show off their computer problem solving skills.

This year, three categories are available: Elementary, Junior and Senior.

Schools and organizations wishing to become contest sites may contact D.T. Piele, ICPSC, Box 2000, University of Wisconsin-Parkside, Kenosha, WI 53141.

Apple Meets IBM

The Personal Computer Userfest is scheduled to be held in both New York and Chicago. The Userfest is a combination of last year's popular Applefest and PC'83 and will feature products that apply to both the IBM PC and Apple microcomputers.

In addition, workalike and lookalike computer manufacturers have been invited to participate in this year's events. The Chicago show will be held May 3–6 at the O'Hare Exposition Center. New York's show is slated for September 20–23 at Madison Square Garden.

For more information on either show, contact Northeast Expositions, 822 Boylston St., Chestnut Hill, MA; 800-841-7000, or from within Massachusetts, 617-739-2000.

Cambridge Computer Conference—Cambridge, MA

Lesley College and the Computer Education Resource Coalition are cosponsoring the Sixth Annual Computer Conference for Educators. The event will be held at Lesley College in Cambridge, MA on May 5.

The program will feature several presentations as well as workshops and a panel debate. For registration information, contact Susan Friel or Nancy Roberts at Lesley College, 29 Everett St., Cambridge, MA 02238; 617-868-9600.

CLUB NOTES

Chicago Group Fights Finances

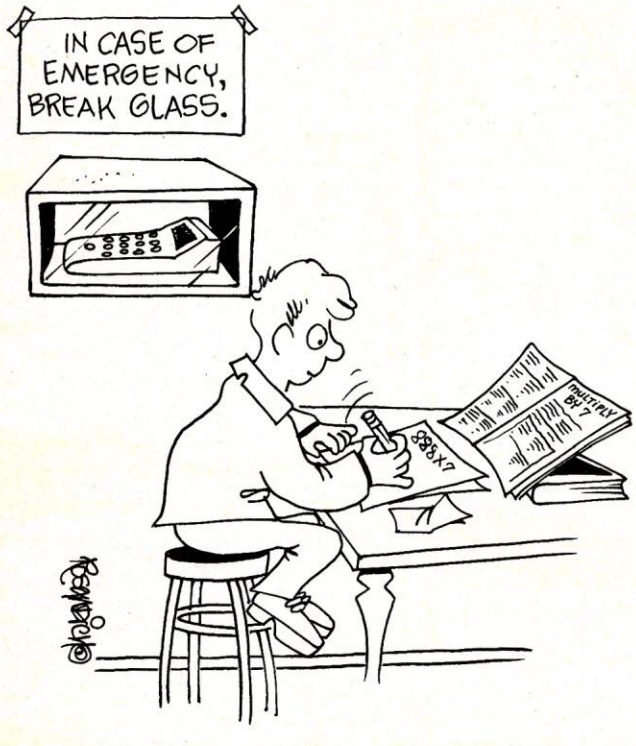
The Chicago Financial Microcomputer Users Group, CFMUG, holds regular meetings, workshops and seminars. It provides members with a forum to exchange ideas on the financial and business use of micros.

This spring the group will hold a seminar on decision aid software with demonstrations on asset liability, retail services and commercial loan analysis. For information contact Diane L. Schauer, c/o Mt. Prospect State Bank, 111 E. Busse Road, Mt. Prospect, IL 60056.

NW Computer Society

The Northwest Computer Society meets on the third Thursday of each month at 7 p.m. in the Federal Building of Seattle, WA.

The Society's monthly newsletter includes a calendar of events for users of TRS-80, CP/M-based systems and other systems. The society offers its members discounts at various computer stores and computer courses at Seattle Community College. For information call or write Jim Adkins, Club Secretary, PO Box 4193, Seattle, WA 98104; 206-633-3182.



Southern MUMPS

College Park's MUMPS Users Group, over 800 members strong, aims to advance the use and knowledge of MUMPS. This programming language and data management system is now used in more than 10,000 commercial, industrial and medical institutions worldwide, in addition to a growing number of configurations involving MUMPS and PCs.

For information call or write: MUMPS Users Group, Suite 308, 4321 Hartwick Road, College Park, MD 20740; 301-779-6555.

The JUG of the West

The Jefferson State Computer Users Group meets monthly, publishes a monthly newsletter and gives members the opportunity to participate in seminars using computer aided instructions. For information write Paul Myers, PO Box 320, Gold Hill, OR 97525.

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Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to: **Classifieds, Kilobaud Microcomputing, Peterborough, NH 03458**. Do not include any other material with your ad as it may be delayed.

Video Cassettes: Computer Training Literacy Tapes hardware, software history and terminology VHS, BETA, 3/4-inch 50 min. Free brochure Custom Video Corp. 5800 E. Skelly Drive, Suite 712 Tulsa, OK 74135; (918) 665-7850.

1984 COMPUTER BUYERS' GUIDE Mini/Micro Computers, Peripherals, Furniture. Major manufacturers included. Product pictures, and descriptions. $9.95 each, Quantity discounts. Directory Group 5800 E. Skelly Drive, Tulsa, OK 74135; 918-665-7850.

FOR SALE: Three unused Shugart eight-inch SA1002 5.33 Mb hard disk drives, $269 each. Western Digital controller for this drive, $331 each. Easy to interface to Heath, Apple, IBM, TRS-80. Herb Merrill, 20 Randy Drive, Taylors, SC 29687; 803-877-9444

DEALER DIRECTORY

Nokomis, FL

We are the leading area computer store. We carry Cromemco, Apple, Vector Graphic; printers and terminals. We offer full software support including G/L, A/R, payroll and word processing. Computer Centre, 909 S. Tamiami Trail, PO Box 130, Nokomis, FL 33555. 484-0421.

Aurora, IL

Full line of Apple Computer and Fortune Computer, Hewlett-Packard Personal Computers, Calculators and Supplies. IDS Prism, SMC and Daisywriter Printers. Farnsworth Computer Center, 1891 North Farnsworth Ave., Aurora, IL 60505 (851-3888) and 383 East North Ave., Villa Park, IL 60181 (833-7100).

Dealers: Listings are $15 per month in prepaid quarterly payments, or one yearly payment of $150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.

BOOK REVIEWS

PC Graphics Gold Mine
Apple Machine Language Mechanics
Kaypro Manual: Perfect!

PC Graphics

Dick Conklin
Wiley Press, 1983
605 Third Ave.,
New York, NY 10158
Softcover, 182 pp., $15.95

The quality of Dick Conklin's *PC Graphics*, a volumn in the Wiley IBM PC Series, is consistent with its predecessors in every way. It is no surprise that the author delivers what his title implies. It should; Conklin is the product planner who is responsible for system software on the IBM PC. He is involved with dealer training, program demonstrations and technical support of the PC.

The presentation of *PC Graphics* is clear, meticulous, comprehensive and a credit to the PC literature. If there is anything you want to know about graphics on the IBM PC, this is the place to start. After reading this you have a fair chance at saying good-bye to other graphics references. *PC Graphics* is a gold mine; its nuggets lurk everywhere.

Diagrams and programs appear in profusion. Most items covered in the text are accompanied by a program example as well as a diagram or table. These ample supplies of high quality support documentation serve as a major help factor in your selection of micros. Conklin's book provides support that will lead you to buy an IBM PC.

The goodies start in the preface and continue throughout the book.

The first chapter carries a run-down of hardware and software options: video cards; tv, monitor, RGB; black-and-white, color attachments; dual video card systems; Basic and BasicA.

Line and block graphics are covered in the second chapter: ASCII characters in ROM; making special characters from the keyboard; printer special characters; animation; animation by screen-switching pages of video-stored data; shading; bar charts; project schedule charts; save screen to disk; slide shows; flowcharts; reading data from the screen; booting programs and double-sided disks.

Medium- and high-resolution graphics are covered in the third chapter: controlling all the pixels; mixing text and graphics; drawing lines; plotting data; sketching via the keyboard; background colors; stepping; multiple data plots; scaling; more bar charts; curve fitting; collision detection; moving and re-orienting screen images; enlarging letters; mixing colors; high-resolution graphics.

Nuggets—No Sweat!

The section on curve fitting is one of the best nuggets. It explains least squares data fitting in a "no-sweat" manner and contains a Basic routine to perform it. One of the miracles of micros is that the software makes high-powered wizardry pop out of solid rock and drop right into your pocket.

Goodies available only with Advanced Basic (as in BasicA) are explained in Chapter 4: circles, arcs, wedges; pie charts; computer art; the Paint instruction; real time; high-speed animation; arcade games; the Draw instruction (a graphics definition language in itself); angle, scale; moving foreground with fixed background; and background music.

Special graphics applications are covered in Chapter 5: saving graphics screens; slide shows; changing built-in characters; trapping light pens, joysticks and paddles; printer graphics; the graphics subroutines; compiled and assembled subroutines; translation and rotation; digitizers, plotters, color printers, videodisks; and the RS-232C Asynchronous Communications Adapter.

Dirty Deeds

It may be difficult to visualize how anyone can cover so many topics concisely but the deed has been done. Some readers will say that the paragraph on videodisks is completely inadequate or the few words given to the assembler are meaningless, but those subjects are really outside the scope of the book. All areas have been covered with the important details you graphics users require.

A note on the front cover states "Programs Available on Disk" while a note on the back cover informs you to "Ask for them at your favorite computer store, or use the order form inside." Better ask. I have yet to find the promised order form in my copy of this book.

James Derry
Akron, OH

Word Processing Buyer's Guide

Arthur Naiman
BYTE/McGraw-Hill, 1983
Princeton Road,
Highttown, NJ 08520
Softcover, 325 pp., $15.95

In case you haven't visited your local book store lately, you should know that computer books are becoming the rage. It's getting to the point where books on Basic and CP/M are beginning to edge Garfield out of his shelf space. Let's just hope that America's favorite feline doesn't decide to retaliate.

Out of the hundreds of titles now springing onto the scene, some of the most popular are those dealing with word processing. This really shouldn't come as any surprise. Word processing is certainly one of the most popular microcomputer applications and it's only natural that people would want to read and learn about the text management revolution these programs offer.

Good, Solid, Practical Advice

One of the more recent offerings in this hot genre is the *Word Processing Buyer's Guide* by Arthur Naiman. According to a cover blurb, this is a book that aims to provide "good, solid, practical advice on all areas of word processing." A worthy promise for its first 50 pages, the book presents a workmanlike overview of the current word processing scene.

The usual topics are covered; how a computer works, what word processors do, selecting a printer and so on. Most of this material is useful, although some of it is downright bizarre. For instance, as a

cost-saving measure, Naiman suggests that Apple II owners use a separate terminal rather than purchase an 80-column card.

Things Fall Apart at the Seams

The bulk of Naiman's work is devoted to capsule reviews of more than 100 different word processing programs and detailed analyses of 14 others. Here the book falls apart. While some major programs, such as Easy Writer, WordStar and Scripsit, are given meaningful reviews, a variety of other important packages are analyzed with no more than a dozen words. Many are dispatched with the phrase "I wrote this company for information and didn't receive an answer." Has Naiman ever thought of using a telephone?

The remaining text consists of a look at some of the dedicated word processors, a brief overview of the best-selling micros and a fairly extensive word processing glossary. On the whole, the book is unsatisfying. Naiman's work presents little in the way of original insight and his flippant writing style tends to trivialize a topic that deserves more serious consideration. True, lives may not depend on a book about word processing but many dollars do. Readers looking for a top-notch guide to word processors should look elsewhere. *The Word Processing Primer*, also published by BYTE/McGraw-Hill, takes a much more professional approach to the subject.

Of the *Word Processing Buyer's Guide*—buyers beware!

John Edwards
Glendale, NY

Intermediate-Level Apple II Handbook

David L. Heiserman
Howard W. Sams & Co., Inc., 1983
4300 West 62nd St.,
Indianapolis, IN 46268
Softcover, 328 pp., $16.95

Author David L. Heiserman has produced an eloquent and detailed look at the workings of Apple machine language. His emphasis is on how to blend Apple's use into Basic programs. With such a focus, you are expected to know Basic and have a strong desire to learn how to communicate using a language close to Apple's native tongue.

All the example programs and techniques in this book are based on Integer Basic, which (if memory serves) was the language the Apple II spoke. With the advent of the Apple II Plus (and now the Apple IIe), Integer Basic has been relegated to the DOS 3.3 master disk in order to be put into the memory of only those micros with 64Kb of memory.

While AppleSoft and Integer Basic are similar, the latter works only with whole numbers (thus the name, Integer) from as small as −32,767 to as large as 32,767. Though many commands are the same for both versions of the language, my Basic Reference Programming Manual lists 48 that are available in AppleSoft rather than in Integer.

Sprinkles of Anachronisms

As such, this volumn is sprinkled with anachronisms, even to a discussion of the capabilities of an Apple with a 16Kb of memory (how long ago did they make those?).

Even at that, if you work with Integer Basic (which has some advantages for certain graphics applications) and if you'd like to learn machine language, this book takes you by the hand and leads you gently into this often difficult world. Heiserman is knowledgeable and can impart his thoughts in an understandable way. You're comfortable as you work your way through the myriad of charts and program examples.

You start with cursor positioning, including TAB and VTAB, and how to simulate what other versions of Basic call a "print at" statement. You find out how to set the size of the window you work with on your screen and even how to make numerals flash (bet you didn't know they won't with the Flash command). Heiserman shows you how to switch between memory pages and how to write on one when you display another.

There's a 6½-page chart that details color codes you can poke into memory in low-resolution graphics for each half of every two-color block. You can create just about any combination you'd like, from magenta/purple to pink/medium blue to aqua/brown. The data on high-resolution graphics is just as detailed, with a nice mixture of Basic and its associated machine-language commands. Shape tables are covered (but remain a complex and time-consuming project).

The final chapter covers the miniassembler that's built into the Integer Basic ROMs, a simple yet helpful ". . . assembler that accepts the humanly understandable assembly-language instructions and translates them into their machine-language counterparts." Even with this advanced information, Heiserman lapses into the old days and instructs you on how to save and load machine language programs from the miniassembler onto the cassette tape.

If there's any major weakness to Heiserman's information (other than the total focus on Integer Basic), it's the lack of real-world examples of how all this knowledge might be used. There's an abundance of programs to study but too little advice on how to apply what you just figured out. Heiserman also warns that with this type of programming, "Disk Operating Systems (DOS) can cause some problems at times. . . DOS users will have to consult their technical manuals to discover ways to resolve any conflicts in RAM organization." Sadly,

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he doesn't warn you what these difficulties might be or when they might pop up.

For its somewhat severe limitations and tight focus, the book is well-written and understandable. If you have the interest, you'll learn from it. And after all, isn't that the whole idea?

Gregory Glau
Prescott, AZ

The Perfect Manual for the Kaypro II Second Edition

Gregory T. Platt and Roz Van Meter
People Talk Associates, Inc., 1983
Plano, TX 75074
Softcover, 300 pp., $21.95

Perfect Software (and consequently, every machine that bundles it) has been plagued by one major problem: documentation. Most of the essential information you need to run it is there—if you can find it. Finally, a book has appeared that will help the beginner get started with his new toy. *The Perfect Manual for the Kaypro II* will get you going.

Written by Gregory Platt and Roz Van Meter, *The Perfect Manual* is written so that the beginner can sit down and start using a Kaypro. You start out turning the machine on and are lead through until you are almost ready to venture alone.

While it doesn't explain all the software that is bundled with the Kaypro II, the manual does introduce you to the Perfect series and CP/M. The information is generally good and reliable.

Bugs Out to Bite

Several items are helpful. One lists some of the idiosyncrasies of each program, you know, the little bugs that can creep out and bite you. For instance, they remind you that earlier versions of Perfect Speller have a nonworking command to change the marking character used for misspelled words. There is a three-page list of these for Perfect Filer. Look at all the fine ways your software can take off to another planet!

The manual is also quite handy for showing undocumented commands that work on each item of Perfect Software. This is very useful. I was glad to discover that you can write a portion of a document to another file so easily. This points out that there are several important things about Perfect Writer that Perfect Software is oblivious to.

A careful reading put a few minor bugs out to lunch. Footnote 10 on page 2-13 incorrectly states that CP/M expects command lines to be entered in uppercase. This really makes no difference as the CCP will automatically translate everything into uppercase.

Because I am a writer, I paid special attention to their advice about Perfect Writer. Most of it is very good. I differ with them as far as printers go. They say you shouldn't try to configure a proportional spacing printer on your own, and they tell you about the vast time span that occurred before some would work. This is only half right in that there are some simple (and undocumented) ways to do the job. I have trouble believing it took three days to set up a Gemini printer.

Happy Days Ahead

If you are trying to configure your printer for the first time, you will be glad to see Appendix C. It offers a brief introduction to the configuration process and lists 60 completed configurations as sent out by Perfect Software last summer. Having already seen this list, I double-checked my notes. The authors were correct for installing a disclaimer. The listings need extensive debugging. Some contain garbage code and any that define proportional printing will not work correctly with the width table specified unless you overhaul it.

I commend Platt and Van Meter highly for printing the book with an Okidata 92 printer because it shows Perfect Writer's capabilities. Many of Perfect Writer's fine features are nicely demonstrated. From my own research in writing a book about configuring Perfect Writer to printers, the Okidata is the easiest one there is to match up.

The stage has been set for a more advanced set of reference books to supplement Perfect Software's poor documentation. I hope they will follow up this introductory work with a set of tutorial books to guide us through all the other powers of Perfect Software they so aptly demonstrated.

If you are frustrated with trying to get your Kaypro to perform, don't give up. *The Perfect Manual for the Kaypro II* should be a valuable guide to getting started. It is worth the asking price of $21.95.

Thomas Howe
Mill Valley, CA

From the MC Bookself

This month the MC Bookself will take you from buyer's and software guides to database and language references.

John Wiley & Sons, Inc., (605 Third Ave., New York, NY 10158) has a strong series of Kelly-Grimes Buyer's Guides. Kelly and Grimes write for first-time computer shoppers and for computer owners who want to expand their system.

The six titles in the Kelly-Grimes series are:

- *Buyer's Guide for IBM Personal Computers* (May 1984, softcover, 320 pp., $19.95).
- *Buyer's Guide For Digital Equipment Microcomputers* (May 1984, softcover, 320 pp., $19.95).
- *Buyer's Guide For Apple Computers* (June 1984, softcover, 320 pp., $19.95).
- *Buyer's Guide For Commodore Computers* (June 1984, softcover, 320 pp., $19.95).
- *Buyer's Guide For IBM PC Compatibles* (July 1984, softcover, 320 pp., $19.95).
- *Buyer's Guide For Word Processing Systems* (July 1984, softcover, 320 pp., $19.95).

Each of these volumes contains an article by the hardware manufacturer describing new and forthcoming products. In addition to the buyer's guide series, Wiley also has released a handy set of Basic Quick Reference Guides for the DEC Rainbow, Kaypro 1, TRS-80 Model 100 and Timex Sinclair.

Each guide gives you instant access to your micro's myriad of programming symbols and statements, commands and controls. Wiley also offers a Quick Reference Guide to IBM's operating system, PC DOS.

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Quick Reference Guides are sold in packs of ten, priced at $29.50 per pack; the *PC DOS Quick Reference Guide* sells for $39.50.

Shuffling in the Soft Lane

Several companies have released software guides, and language and utility references.

From datapro/McGraw-Hill (1221 Avenue of the Americas, New York, NY 10020) are three software packages, each designed for specific micros.

- The *datapro/McGraw-Hill Guide to Apple Software* (1984, softcover, 267 pp., $19.95) provides profiles of software written to run on Apple II, Apple II Plus, Apple IIe and Apple III.
- The *datapro/McGraw-Hill Guide to IBM Personal Computer Software* (1984, softcover, 195 pp., $19.95) features profiles of software designed to run on the IBM PC, IBM PC XT and IBM PC compatibles.
- The *datapro/McGraw-Hill Guide to CP/M Software* (1983, softcover, 241 pp., $19.95) offers profiles of software prepared for more than 130 different micros compatible with CP/M.

The major applications covered in each guide include accounting, graphics, sales and distribution, management science, word processing and text editing.

Also from Osborne/McGraw-Hill (2600 Tenth St., Berkeley, CA 94710) is a book book written by Elna Tymes and Peter Antoniak called *SuperCalc Home and Office Companion* (1984, softcover, 181 pp., $15.95). Written for both inexperienced and advanced users, the book offers more than 60 bug-free, ready-to-run SuperCalc models that can be tailored to your needs. Each model is presented with instructions for use, a sample worksheet and a computer listing.

Howard W. Sams & Co., Inc., (4300 West 62nd St., Indianapolis, IN 46268) has released a new reference guide to CP/M and its associated languages and utilities. Titled *CP/M Bible* (softcover, $19.95) by Mitchell Waite and John Angermeyer, the book outlines more than 50 CP/M-related topics.

Database Delight

From Collier Books, Macmillan Publishing Co., (866 Third Ave., New York, NY 10022) comes a classy database directory. Authors Mike Edelhard and Owen Davies have compiled a complete evaluation of more than 1000 databases available for your personal computer in their *Omni Online Database Directory* (1983, softcover, 292 pp., $10.95).

Another database guide from Associated Technology Co., (Box 448, Estill Springs, TN 37330) helps software departments formulate their own database standards for micros. *dBase II* (softcover, 46 pp., $22) is designed for personal and small business computers.

To assist you in the factual side of computing are several new titles:

Fact Attacks

- The *1984 Microcomputer Market Place* by Dekotek (2248 Broadway, New York, NY 10024; softcover, $75) is a comprehensive, up-to-date directory of the microcomputer industry.

- The *BBS Directory* ($5.95) lists all the bulletin boards in North America, including more than 700 listings by state, area code and computer. *BBS Directory*, PO Box 4215, Beach Station, Vero Beach, FL 32964.

- *Public Domain Software for the IBM PC* from PC Software Interest Group (1556 Halford Ave., Suite 130R, Santa Clara, CA 95051; $2.95) lists hundreds of public domain and user supported programs for the IBM PC. Programs are also available on disk; a set of ten is $59 while the complete set of 75 disks cost $439.
- *Microcomputer Essentials* from Gray Data (3071 Palmer Square, Chicago, IL 60647; $2.95 per card) is a set of six reference cards for CP/M-80 operating system, WordStar, VisiCalc and dBaseII. It also provides cards on Selecting a Microcomputer and Digital Reference information.
- *"Basic Algorithms" Micro Chart* from Micro Logic Corp., (PO Box 174, Hackensack, NJ 07602; $5.95 per card) is a double-sided, laminated 8½ × 11-inch card with algorithms written in minimal Basic and four sorting methods. For graphics users, an efficient three by five dot matrix character set is also included on the card in both visual and encoded form.

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SeriesOnePlus 2.0—New and Improved InteSoft Integrates Business Software Everything for Your Apple in One Program Get Executive Privileges on the IBM

Executec's Enhanced Integrated Software

SeriesOnePlus release 2.0 is an enhanced version of the SeriesOnePlus integrated software system that supports additional user interface devices and screen display processes.

The software allows support for most locator devices available for micros, including mice, light pens, touch-sensitive panels and voice input.

The product design also allows you to take full advantage of advanced windowing features offered by products of other software developers, such as Microsoft Windows. SeriesOnePlus 2.0 provides locator manipulation controls within each application developed by Executec. This feature serves to accelerate user interaction and facilitates the selection of commands, functions and utilities throughout the system's operation.

All SeriesOnePlus 2.0 applications have full color support across all processes, offering options in color selection and display flexibility. New help concepts are built into each application, including automatic display of each option open to the user.

Priced at $495, the new software products included in the SeriesOnePlus release 2.0 include Execu/File for data management and Execu/Plot for graphics. Execu/Bus offers master program utilities that provide a consistent user environment and data sharing output capabilities. Two optional software packages the Execu/Reporter (a report generator) and the Execu/Model (spreadsheet analysis) are available for $295 each.

The products are manufactured by Executec Corp., 12200 Park Central Drive, Dallas, TX 74251. Reader Service number 460.

Integrate InteSoft's Next Generation Business Software

Schuchardt Software Systems, Inc. has introduced an integrated office automation software system designed for the IBM PC and compatible systems.

Called InteSoft, the system consists of seven products:

- Intecalc ($295), a spreadsheet program. Its split-screen and multiple-screen displays can handle sophisticated projection or analysis.
- Inteword ($395), a word processing system.
- Intebase ($495), a relational database management system that integrates fully with other InteSoft components and other leading software packages. It lets you call up portions of other programs on a split screen.
- Intemate ($195), a program integration system. It lets you move information and jump from one program to the next without having to learn your computer's operating system.
- Intevate ($195), an applications generator especially designed for the IBM PC.
- Intepert ($195), a critical path analysis system. It schedules projects and does resource allocations.
- Inteplan ($149), an executive time-management system that makes notes and lets you keep track of nine separate accounts.

Schuchardt's future plans include an electronic mail program, computer communications, graphics and other executive productivity tools. Schuchardt Software Systems, Inc., 515 Northgate Drive, San Rafael, CA 94903. Reader Service number 461.

Apple Integrates Productivity Tools

Integrated software for Apple II and Apple III computers combines word processing, database management and financial modeling in one program.

Called AppleWorks for the Apple II, and III E-Z Pieces for the Apple III, the software is designed for people who require several productivity tools in their work. The program provides three levels of integration: word processing, spreadsheet and database management.

The word processing application displays documents on the screen as they will appear when printed, including centering, indented text and page breaks. It incorporates advanced text processing features, such as proportional spacing, superscripts and subscripts, boldface characters and find-and-replace capabilities.

The spreadsheet program provides a large work area of 999 rows by 127 columns, extensive cell formatting commands and row sorting. AppleWorks and III E-Z Pieces can read VisiCalc data files and can read and write DIF files.

The database manager is similar to Apple's Quick File data management system. You can arrange up to 30 categories of records in alphabetic, numeric, date or time order. The program is memory-based, so sorting is fast—for example, using AppleWorks, 800 records can be sorted in ten seconds. The built-in report function can create and print reports in either table or label formats. The program can read Quick File data files.

The integrated software includes a desktop manager that handles utility functions, such as loading and saving files, formatting disks and specifying printer information.

The desktop manager is menu-driven for easy use. An interactive training disk comes with AppleWorks.

AppleWorks is based on ProDOS, Apple's new operating system for the Apple II that is compatible with the Apple III Sophisticated Operating System (SOS). As a result, both AppleWorks and the SOS-based III E-Z Pieces can use mass storage systems. Apple's five megabyte ProFile hard disk and data files can be used interchangeably between Apple II and Apple III computers.

AppleWorks requires an Apple IIe with 64Kb of memory, an 80-column card, one disk drive and a monitor. Apple's extended 80-column card for the IIe, which provides an additional 64Kb of memory, and a printer are recommended. It is priced at $250.

III E-Z Pieces requires an Apple III with 256Kb of internal memory. It is priced at $295 from Apple Computer, Inc., 10260 Bandley Drive, Cupertino, CA 95014. Reader Service number 462.

Software/Disk Subsystem Boosts IBM PC Performance

The Information Manager is a hard disk/software subsystem that provides executives with an integrated set of business application programs.

Manufactured by ZETEC Corp., the software package is installed on a 10Mb or 15Mb 5¼-inch Winchester disk drive, forming a complete IBM PC-compatible subsystem. By integrating several applications software programs and installing them on high-capacity Winchester disk drives, ZETEC provides you with a unified database; information generated in one software package can be freely shared with the other packages in the subsystem. The integration of the various packages is achieved through ZETEC's propriety linking software shell.

The self-prompting, menu-driven shell was developed as part of the Business Manager subsystem, ZETEC's initial product that is designed for various small business applications. The Information Manager subsystem's shell is used to integrate WordStar, SpellStar, Mailmerge, Report Manager, Project Manager, Appointment Manager, Personnel Manager and Micro-RIM.

The Information Manager subsystem lists at $4000 for the TIM-10 10Mb and $4700 for the TIM-15 15Mb (single quantities; OEM discounts are available). It is manufactured by ZETEC Corp., 1420 E. Edinger Ave., Suite 115, Santa Ana, CA 92705. Reader Service number 464.

Step Up to Apple's Unofficial Logo

Version 2.0 of Logo for the Apple II, Apple Plus and Apple IIe has been announced by Terrapin, Inc. Enhancements over version 1.3 include:

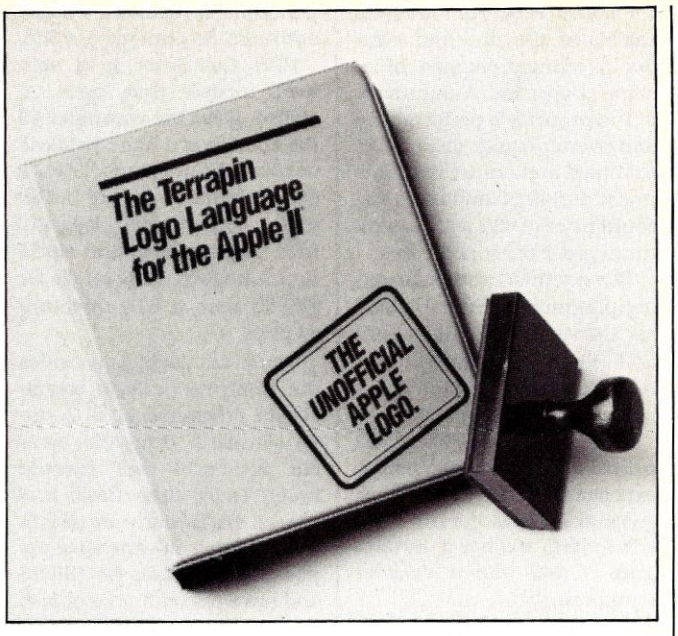
- The addition of six new primitives and several editor commands;
- Improved garbage collection capabilities, available for the first time on any Apple-compatible Logo;
- Full-function support for all four cursor keys on the IIe;
- Ability to read program files created under Apple Logo.

The new primitives offer several benefits, such as easy switching between two different disk drives. Movement of text is made simpler by a Yank command. The improved garbage collection virtually eliminates the problem of running out of workspace.

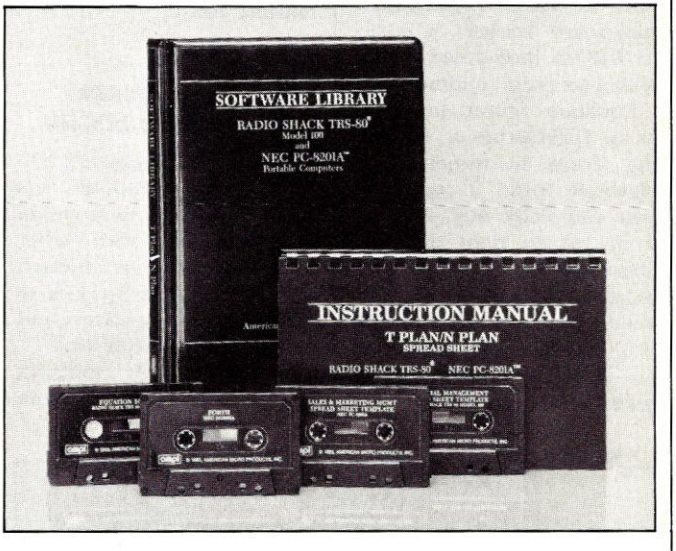
Terrapin has also released enhanced documentation with an extensive "Words and Lists" chapter in its Logo manual. In addition, over 40 programming projects and their solutions are included in the 142-page document.

Terrapin's Logo version 2.0 is priced at $149.95 for the language disk, full documentation and utilities disk. The "Words and Lists" chapter of the documentation sells for $12.50. Owners of Terrapin Logo 1.3 may update to version 2.0 for $20 and obtain the "Words and Lists" chapter for an additional $5.

Terrapin, Inc., 380 Green St., Cambridge, MA 02139. Reader Service number 463.



Terrapin introduces version 2.0 of its Logo language for the Apple II, Apple II Plus and Apple IIe.



American Micro Products has introduced a family of software products designed to meet the requirements of laptop computer users. Initially, the products are available for the NEC PC-8201A and Radio Shack TRS-80 Model 100 PCs.

Add Eight Programs To Your Portable's Library

Eight programs for portable computers are now available from American Micro Products, Inc.

Heading the list of new software for the NEC PC-8201 and Radio Shack TRS-80 Model 100 portable computers is T Plan/N Plan, an electronic spreadsheet that handles as many as 96 rows and 26 columns. T Plan/N Plan is priced at $65 and has a discount price of $42 with a minimum order of six programs.

Other new business-oriented products include Portfolio Analysis and Income Property Analysis. Portfolio Analysis evaluates stock portfolios and calculates portfolio value, the yield of the portfolio and dividend yield, as well as other factors. Data can be entered manually or tapped automatically from the Dow Jones public database. It is priced at $65 and has a discount price of $42 with a minimum order of six programs.

Income Property Analysis calculates the pre- and post-tax investment potential of income properties. A summary of the property's performance and overall equity yield is determined and annualized. It is priced at $49.95 and has a discount price of $32 with a minimum order of six programs.

The scientific and engineering programs include Statistical Curve Fitting, Histogram and Plot, Equation Solver, RPN Calculator and the Forth programming language.

Statistical Curve Fitting calculates and plots linear, power, exponential and logarithmic regression analysis curves. It retails for $65 and has a discount price of $42 with a six-order minimum.

Histogram and Plot calculates and plots histograms, displaying as many as ten bars at a time. The program also calculates mean and variance as well as plotting normal curve overlays. It retails for $49.95, discounted to $32 with a six-order minimum.

Equation Solver performs as an AOS-calculator, emulating Texas Instruments-type algebraic logic. In addition, you can copy any formula from left to right and, by changing one or more variables, note the effect on the resultant function. Special vertical applications templates are available for business or scientific and engineering applications. It retails for $39.95 and has a discount price of $25.

RPN Calculator is a software module that, once installed, gives the computer all the abilities of a hand-held calculator. Features include a comprehensive set of arithmetic, exponential, logarithmic, trigonometric and statistical functions. RPN retails for $29.95 with a $19 discounted price.

The Forth package provides the ability to perform assembly-like programming in Forth-79 standard. Programs written in Forth will execute much faster than Basic programs, particularly in graphics and other I/O-intensive applications. It retails for $99.95 and has a discount price of $64.

The eight software packages are available from American Micro Products, Inc., 705 North Bowser, Richardson, TX 75081. Reader Service number 465.

Telecommunicate With Epson's HX-20

EpsonLink, for Epson's HX-20 Notebook computer, lets you exchange information and programs with other computer users or through such information services as The Source, CompuServe and Dow Jones News/Retrieval.

EpsonLink can transmit and receive data to and from memory or microcassette in either character or block transmission mode. The software also features the ability to transmit and receive communications data in the interactive conversational mode using single keystroke commands.

Other single keystroke commands enable the software to communicate with nearly all asynchronous remote data transmission systems and to alter the bit transmission rate, number of stop bits, duplex operation setting, character length, transmission parity, error checking, automatic line feed and virtual screen size.

EpsonLink costs $49.95. Epson America, Inc., 3415 Kashiwa St., Torrance, CA 90505. Reader Service number 466.



EpsonLink is a telecommunications program for Epson's HX-20 Notebook computer.

UltraFile Your IBM

UltraFile, for IBM PC and IBM XT computers, features three programs: filing, reporting and graphics.

Incorporated into the program is a step-by-step tutorial showing you how to set up a sample database. The program also contains five additional sample databases, including inventory, expense tracker, sales history, phone list and a transaction listing. You can employ these formats as is or adapt them to your specific needs.

UltraFile can accommodate databases of up to 32,000 records, with 1000 characters per record, 50 fields per record and 100 characters per field.

System requirements for UltraFile include 128Kb of memory, DOS 1.1 or 2.0, two double-sided, double-density disk drives or one double-sided disk drive plus a hard disk. A color display card is required for graphics features.

UltraFile is menu-driven and can interface with such spreadsheet programs as VisiCalc, SuperCalc 2, Lotus 1-2-3 and word processing programs such as WordStar, Volkswriter and EasyWriter.

In addition, UltraFile interfaces with most programs that use DIF or sequential files, such as Continental's F.C.M. (Filing, Cataloging and Mailing). Data can be transferred from complementary programs to and from UltraFile without rekeyboarding.

The system has been designed with powerful graphics capabilities. Using various color combinations, UltraFile produces line, bar and three-dimensional bar and area graphs. You can plot up to five different data item functions on one graph and select any one of 16 different color combinations to color a graph.

UltraFile retails for $195 from Continental Software, 11223 South Hindry Ave., Los Angeles, CA 90045. Reader Service number 471.

New VisiCalc Templates Analyze Finances

Financial Analysis Statement Templates (F.A.S.T) is a series of templates that converts VisiCalc data into useful comparisons and reports for analyzing a variety of financial statements.

Designed for business owners, accountants, investors, managers, bankers or any business analyst, F.A.S.T. takes ordinary financial reports, such as balance sheets, income statements and changes in financial position, and calculates reports and comparisons.

The twelve separate worksheets and programs included with F.A.S.T. are: Financial Statement Data Entry; Price/Quantity Data Entry; Ratio Analysis Report; Valuation Analysis Report; Financial Summary Comparison; Performance Summary; Balance Sheet Comparison Report; Income Report Comparison; Profitability Analysis; Statistical Analysis; Price/Cost Report; and Productivity Analysis Report.

Apple II and Apple IIe hardware requirements call for 48Kb of memory, one or two disk drives and a printer (132 columns optional). IBM PC or XT hardware requirements are 128Kb of memory, DOS 1.1 or 2.0, two double-sided disk drives, one display card (monochrome or color) and a printer (132 column optional). The Texas Instruments Professional needs 128Kb memory, MS DOS, MS Basic, one or two disk drives and a printer (132 columns optional).

F.A.S.T. is priced at $99.95 from Continental Software,

11223 South Hindry Ave., Los Angeles, CA 90045. Reader Service number 474.

VT100 Series Terminal Emulator

Smarterm 100 is a full-featured terminal emulation/file transfer software package for the IBM PC and compatible systems.

Like its predecessor, Smarterm/PC Model TE100-FT, this new product allows an IBM PC to function as a Digital Equipment Corp. VT100, VT101, VT102 or VT52 terminal and to transfer ASCII or binary program and data files between the IBM PC and a host computer system.

Smarterm 100 sports several enhancements, including smart softkey capabilities. A series of new command sequences has been added that allow the host computer system (or another PC) to control the operation of the PC remotely. The host system can now completely change softkey values and initiate and control file transfer operations between the PC and the host system.

The Startup Command File facility lets you define a series of commands that are automatically performed when the program is started. Using this new feature, Smarterm 100 can automatically select a setup configuration, autodial a host system, log-on, transfer a file, log-off and return to DOS.

Another new feature, online help screens, graphically shows the standard keyboard usage and layout as well as the key mappings for Digital Equipment Corp.'s popular EDT full-screen text editor.

In addition to the standard monochrome and 80-column color video interface boards, Smarterm 100 also supports the SuperVision 132-column monochrome video interface board from California Computer Systems, Inc. (available from Persoft). When Smarterm 100 is installed on a PC equipped with a SuperVision board, both 80-column and 132-column display capabilities are fully supported.

The file-transfer functions of Smarterm 100 let you capture data being sent to the terminal in a disk file and transfer either ASCII or binary files to the host computer without special host programming. Smarterm 100 also includes the ability to transmit and receive ASCII and binary files reliably over telephone lines using a built-in, error-free protocol.

The error-free transfer mode can be used either between two IBM PCs or between a PC and a host computer system. Fully functional sample Basic and Fortran programs that implement the error-free protocol on Digital Equipment Corp. VAX/VMS systems are included on the Smarterm 100 disk.

Smarterm 100 runs under any version of PC DOS and can be installed on a hard disk. It requires 128Kb memory, one double-sided disk drive, an asynchronous adapter and either a monochrome display or an 80-column color monitor.

Smarterm 100 is priced at $149 from Persoft, Inc., 2740 Ski Lane, Madison, WI 53713. Reader Service number 467.

Multitasking Operating System For Networking

Lantech Systems, Inc., has developed a Unix-like operating system for the IBM PC designed specifically for networking.

Called Unetix-DFS, the system expands the basic standalone version of Unetix, which offers multitasking capabilities and compatibility with both Unix and PC DOS. In addition, Unetix-DFS offers the ability to access files and devices on other systems in the network through a distributed file system. It provides a powerful, extremely transparent networking scheme fully compatible with Unetix standalone.

Unetix-DFS runs on many 8086/8088-based micros, including the IBM PC and PC lookalikes. Lantech plans to convert it for Motorola 68000- and National 16032-based systems as well.

The system is appropriate for networking corporate departments with dedicated systems that need to be linked for data sharing. It also allows resource-sharing of expensive peripherals, like back-up storage systems and printers.

Unetix-DFS operates through higher-level communications protocol, independent of the physical network medium. It can be implemented with such popular network interfaces as Ethernet, Omninet and PercomNet.

The system is fully compatible with the Unix System III Network Operating System developed by Plexus. It is priced at $449 per package and is marketed through OEMs, systems integrators and Lantech Systems, Inc., 9635 Wendell Road, Dallas, TX 75243. Reader Service number 468.

Another Windowing Environment for IBM PCs

WindowMaster, a new windowing system that lets computers perform multiple tasks concurrently, has been introduced by Structured Systems Group, Inc.

The WindowMaster system lets you open, close, expand, reduce or move windows on the screen to efficiently perform a number of computing jobs simultaneously. The system includes a full set of productivity applications called WindowPack.

The WindowPack includes: Magic Worksheet, a financial modeling and forecasting package; Word Right, a word processor with mail merge; Analyst, a database; NAD, a name and address system; Graphics; and QSort.

In addition to its own applications programs, WindowMaster can merge Lotus 1-2-3, VisiCalc, WordStar and most popular business computer software into an integrated multitasking computer workstation.

The new windowing software operates under the MS DOS operating system and can be used with the IBM PC, IBM XT and IBM lookalikes. WindowMaster is priced at $495 and at $295 without the productivity software. It is manufactured by Structured Systems Group, Inc., 5204 Claremont Ave., Oakland, CA 94618. Reader Service number 469.

A Business Card for Apple Integration

The Business Card is an integrated package of software and hardware for the Apple II family of computers. The package includes the T/Maker III integrated software program and the CP/M Card with CP/M Plus.

T/Maker, now in its third generation, includes word processing, spreadsheet, list management and bar charting capabilities, all integrated into a single program.

The CP/M Card from Advanced Logic Systems, introduced a year ago, allows the Apple II to run the CP/M Plus operating system (version 3.0) and provides a 6 MHz Z80 microprocessor with an additional 64Kb of memory.

In addition to T/Maker III, the CP/M Card makes available to Apple users thousands of applications packages, including such well-known programs as SuperCalc, dBaseII, Condor, WordStar and Perfect Writer.

The Business Card retails for $499. The price of the stand-alone Apple CP/M version of T/Maker III is $275. Current owners of either the ALS CP/M Card or Z-Card can purchase T/Maker directly from ALS for $165. Advanced Logic Systems, Inc., 1195 E. Arques Ave., Sunnyvale, CA 94086. Reader Service number 470.

The p-system Adds Window Programming

Insight Window Designer creates an open integration system for applications development. It is a "human factors interface" for the p-system with windowing capabilities and enhancements for multiapplication integration.

Packaged as a programmer's tool kit, this machine-independent library includes routines that provide a standard interface for integrating applications, sharing data and managing system resources. The tools speed up development of complex, integrated applications with windows and single keystroke control.

The kit allows concurrent use of several cooperating applications and allows data to

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be exchanged in several ways, including cutting and pasting.

Insight makes extensive use of pointing concepts but does not require special hardware, such as a mouse. High-resolution graphics or color are not required; however, Insight supports color fully if it is available.

The minimum host computer configuration includes 64Kb of main memory, disk-based mass storage, an alphanumeric display with highlighting capabilities and the p-system operating system. Development of Insight-based applications can be done on any computer equipped with the p-system and a UCSD Pascal compiler.

This initial release includes preconfigured tool kits for the IBM PC, IBM PC XT, DEC Rainbow, NEC APC, TI Professional, Corvus Concept and Apple IIe. An easily adaptable version will be available for other eight- and 16-bit micros. Additionally, a runtime version, which allows end users to run Insight-based applications, will also be available.

Insight retails for $150 from SofTech Microsystems, Inc., 16885 West Bernardo Drive, San Diego, CA 92127. Reader Service number 472.

Maintain and Organize in .REL File Format

.REL/M is a package of programs that maintains and organizes relocatable object-code libraries that use the .REL file format. Compilers and assemblers that generate code in this format include many of those marketed by Microsoft and Digital Research.

One of the programs generates compact alphabetized cross-reference listings of module names, procedures called (known as subroutines and functions in Fortran) and externals used. Among other things, this helps you maintain your .REL libraries by readily identifying the side effects that may result when any module in the library is altered.

Another program resequences the modules in a .REL library so that linking may be accomplished in a single pass. This lets you build a library from individual modules and add modules to an existing library, since you can use the program to put them in their correct position. The program can optionally be used to eliminate older versions of any module duplicated within a library.

The .REL/M package is for programmers who build their own libraries of frequently-used subroutines and functions using assemblers and compilers that produce .REL format relocatable code.

.REL/M is for CP/M-based computers (8080, 8085 or Z80 CPU) with 32Kb or more of memory and one or more disk drives. It's available in most disk formats.

The LX costs $59; LS is $89. Packaged together the cost is $129. Compu-Draw Software House, 1227 Goler House, Rochester, NY 14620. Reader Service number 473.

IBM Statistics Package: Graphics/Record Selection

PC Statistician is the first database program package in Human Systems Dynamics' Statistics series for the IBM PC. On Apple II, the Statistics series includes six statistical analysis programs.

PC Statistician provides professionals with a research database, all of the most commonly used statistics and the flexibility of true record selection within analyses. The menu-driven program can automatically choose the correct records for the analysis, even taking into account missing data.

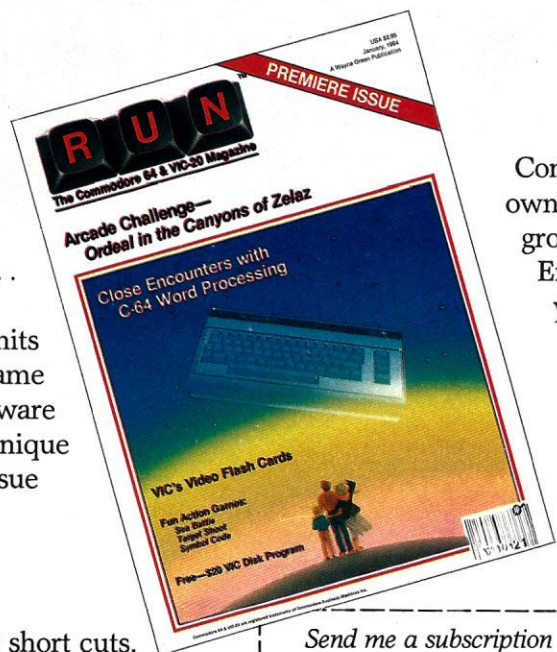
PC Statistician also offers the graphics options of data set plots, bar graphs, scatter plots and curvefitting. Graphics can be displayed on the screen, saved to disk or printed on the Epson or C. Itoh Prowriter printers.

PC Statistician is priced at $300. It requires an IBM PC with 128Kb of memory, two double-sided, double-density disk drives and PC DOS 2.0. A printer is optional. It is manufactured by Human Systems Dynamics, 9010 Reseda Blvd., Suite 222, Northridge, CA 91324. Reader Service number 476.

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Edited by Sheila Wright

The Robie: Kaypro's Compact Desktop Doing Business with the Apple III Plus Toshiba System with Bundled Software Move up to Panasonic's Digital Plotters

Kaypro's Desktop: Two 2.6Mb Floppy Disk Drives

Kaypro's Robie is a new desktop computer that features two 2.6 megabyte floppy disk drives and occupies only about one square foot of desk space.

Other features include a built-in 300 bps modem and a real-time clock/calendar for dating files and documents.

The Robie features a nine-inch, nonglare screen; its dual disk drives are mounted on top of the system. In addition to having all necessary input/output connections for operation with a variety of printers, the Robie comes with a package of ready-to-run programs, including word processing, spelling checkers, electronic spreadsheets, database management and programming languages.



The Robie, Kaypro Corp.'s new desktop computer, features two 2.6Mb floppy drives and a nine-inch, nonglare screen.

The Robie is expected to retail for $2295. Kaypro Corp. 533 Stevens Ave., Solana Beach, CA 92075. Reader Service number 480.

Apple III Plus: IIIs for Your Company

An enhanced version of the Apple III business computer system with new features and updated hardware has been introduced by Apple Computer, Inc.

The Apple III Plus includes the following enhancements:

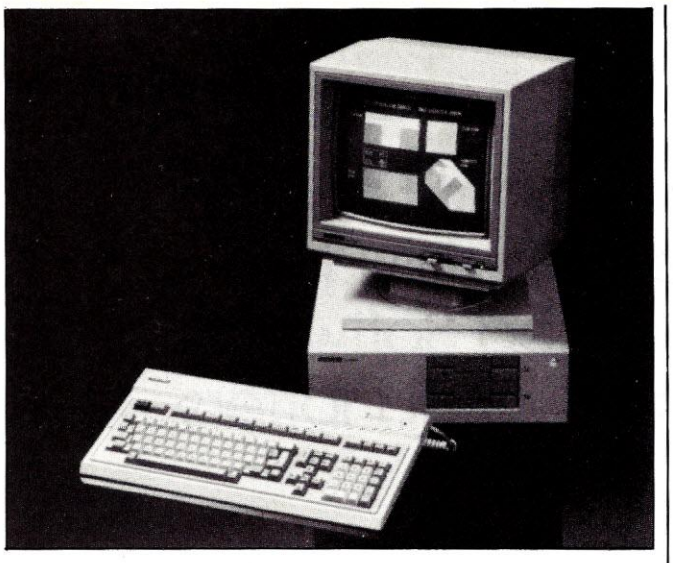
- An interlace video mode that doubles the screen resolution of both text and graphics;
- A clock/calendar function that works with business software programs, such as appointment calendars and "tickler" files;
- An Apple IIe-style keyboard with repositioned cursor control keys and a delete key;
- A designed main logic board and other system hardware modifications that improve the reliability of the system;
- Revisions of the Sophisticated Operating System, SOS 1.3, and system utilities that support the hardware changes.

The Apple III Plus retains the following features: standard main memory of 256Kb; a built-in 140Kb floppy disk drive; an 80-column, upper- and lowercase character display with optional character set fonts; a fully programmable, typewriter-style keyboard with a 13-key numeric keypad; built-in 16-color graphics; a custom-designed microprocessor; and an operating system that ensures file compatibility among all software applications and allows peripherals to be easily added to the system.

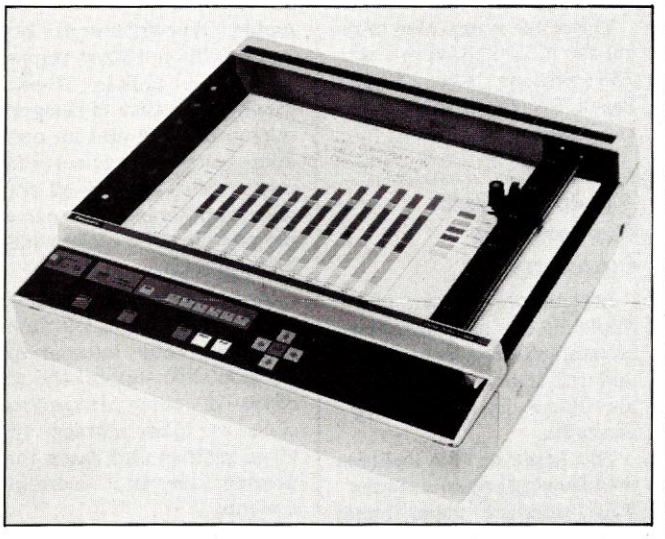
Built-in ports allow connection of printers and telephone modems. Four internal expansion slots support the addition of other accessories, such as mass storage systems, plotters and cards that provide alternate operating systems.

The system is designed to be completely compatible with more than 400 business software programs available for the Apple III. In addition, more than 1500 CP/M-based programs will run on the Apple III Plus when it is equipped with a SoftCard III. Most Apple II software that requires 48Kb or less of main memory will run on the Apple II emulation mode built into every Apple III Plus.

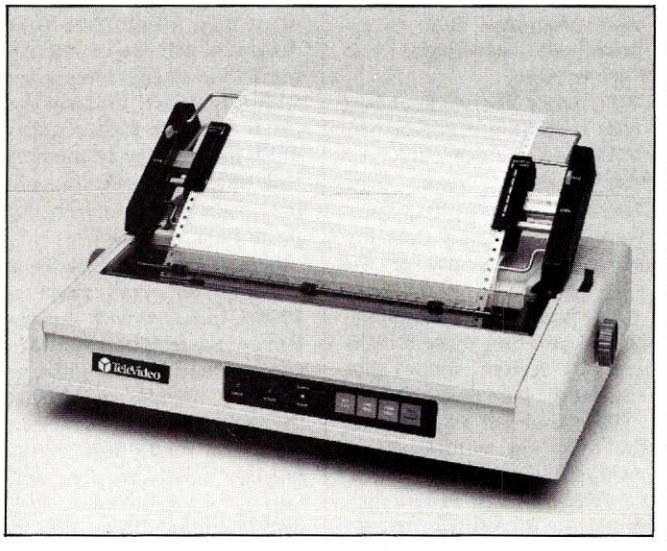
Apple III Plus is available at a suggested retail price of $2995. Included with the system are the SOS operating system, system utilities disks, an Owner's Guide, a Device Drives Guide, an Apple II Plus emulation mode disk, a confidence program for self-testing and a Business Basic demonstration disk. Also included is a new starter pack, which features an introductory manual, interactive



Toshiba's T300 Computer now includes Multiplan and Softword's MultiMate word processor.



Panasonic's color plotter, Model VP-6802P, features built-in italics, rotation, circle and zoom commands.



TeleVideo's TP750 is a daisy-wheel printer that prints up to 50 characters per second.

training disks and a system utilities manual.

Apple III Plus is manufactured by Apple Computer, Inc., 10260 Bandley Drive, Cupertino, CA 95014. Reader Service number 481.

Toshiba Enhanced T300 Computer

Building on its 16-bit micro, Toshiba America, Inc. has made enhancements, added options and bundled productivity software to create the T300 Computing System.

The new package includes a computer with 192Kb of memory, an Intel 8088 microprocessor, 640Kb 5¼-inch floppy disk drives, a 12-inch green display and bundled software. Enhancements include MS DOS 2.0, a new technical reference guide and an extended option list for use with the T300's seven expansion slots.

Heading the new options is a ten megabyte hard disk. Also available are memory expansion cards (up to 512Kb), a clock/calendar board and a 256-color palette. This latter feature combines with Toshiba's latest color display to show 16 colors on-screen.

The basic system features a 12-inch monochrome display with a tilt and swivel mount for convenience. It displays 80 rows of 25 lines and has a resolution of 640 × 500 dots. These same features are available on the optional 14-inch color display with eight colors standard.

The T300's detachable, low-profile keyboard has 103 sculptured keys, including a standard typewriter layout, a grouped cursor control key pad, a separate numeric pad and a set of function keys.

Bundled with each complete system unit is Microsoft's Multiplan and Softword's MultiMate, customized especially for the T300. In addition, the T300 can read IBM PC disks and can execute IBM programs that use standard MS DOS system routines. The system can also run the CP/M-86 operating system.

The T300 includes RS-232C communication ports and a standard Centronics parallel interface.

The T300, which sells for $3090, is manufactured by Toshiba America, Inc., Information Systems Division, 2441 Michelle Drive, Tustin, CA 92680. Reader Service number 482.

Panasonic Digital Color Plotters

Panasonic has introduced two digital color plotters that feature high-speed writing and silent movement.

The color plotter, Model VP-6801P, uses either six fiber-tip, water-based ballpoint plastic pens or six oil-based fiber-tip pens to generate color images over a plotting area of ten by 7.2 inches. Writing speed is 16 inches per second. The unit has an ASCII eight-bit parallel interface, an RS-232C interface and an IEEE-488 interface option. The VP-6801P is priced at $1565.

The second new plotter, Model VP-6802P, has a variety of intelligent functions that simplify the programming necessary to generate complicated engineering drawings or business graphics, including italics, rotation, circle and zoom commands. It also features an electrostatic paper holding method that improves accuracy.

The plotter has a writing speed of 18 inches per second and utilizes eight fiber-tip pens (oil-based ink) to generate color impressions over a plotting area of 14 inches by 10.2 inches.

Model VP-6802P can function unattended using the automatic chart advance option. The unit has an ASCII eight-bit parallel interface, IEEE-488 interface and RS-232C interface.

Model VP-6802P, priced at $3200, is from Panasonic, One Panasonic Way, Secaucus, NJ 07094. Reader Service number 483.

TeleVideo's TP-750: Word Processing Wiz

TeleVideo's TP-750 is a new daisy-wheel printer that prints up to 50 characters per second.

Designed for offices and other professional settings that require large amounts of word processing, the TP-750 has a 96-character print wheel and prints 132 characters at

ten characters per inch, 158 characters at 12 per inch and 197 characters at 15 per inch. It accepts paper up to 15 inches wide.

With proportional spacing, the TP-750 produces 113 to 263 characters per line. It has a bidirectional carriage and uses Silver Reed/Diablo print wheels and Diablo HyType II cartridge ribbons.

The TP-750 is available in serial and parallel interface models. Interface options include RS-232C, Qume and IEEE-488.

The TP-750 weighs approximately 35 pounds; its footprint measures 22½ × 16 inches. It produces less than 68 decibels at a distance of one meter. Optional accessories include a cut-sheet feeder and a tractor feeder.

The TP-750 is priced at $1595. TeleVideo Systems, Inc., 1170 Morse Ave., Sunnyvale, CA 94086. Reader Service number 484.

Cermetek's Modem And Data Duo

Cermetek Microelectronics, Inc. has introduced an external Bell 212A-type modem that plugs directly into the IBM PC, XT or IBM-compatibles, such as the Eagle, Columbia, Compaq or Corona.

The Info-Mate 212PC is supplied with a data communication software package called Modem-Mate. The software allows PC users to transmit and receive files; to autodial data or voice calls; receive or transmit information at full or half duplex; log modem data on a printer; and maintain a 60-entry phone book.

The minimum PC system required to operate the Info-Mate 212PC and the Modem-Mate software is an IBM PC, XT or compatible, PC DOS 1.1 or 2.0, 64Kb of memory, one disk drive and an 80-column display.

The Info-Mate 212PC provides asynchronous data communications at either 110, 300 or 1200 bits per second, supports autodial and autoanswer modes, and automatically detects and uses the proper speed and parity. It supports tone or pulse dialing, and electronic call progress tone detection of dial, busy, ring-back, carrier and the human voice.

The Info-Mate 212PC and its accompanying Modem-Mate software are available directly from Cermetek or through its dealers or distributors. It is priced at $495 and is available from Cermetek Microelectronics, 1308 Borregas Ave., Sunnyvale, CA 94089. Reader Service number 485.

Visionary 1200

Visionary Electronics has just released a 1200/300 bps standalone modem.

Called the Visionary 1200, the modem contains up to 48Kb of battery backed-up memory for sending, receiving and storing messages, including TELEX and TWX, and has its own internal clock/calendar. On-board software gives it the capability of sending and receiving messages automatically.

The Visionary 1200 retains all the features contained in Visionary Electronic's first product, the 300 bps Visionary 100. This includes automatic log-on and automatic data capture/retrieval.

All features are implemented with Visionary's internal firmware and can be executed under control of its clock. The Visionary 1200 operates in originate or answer modes and transmits in either half or full duplex.

Projected prices vary with desired memory from $795 for a 2Kb RAM unit, $895 for a 16Kb unit and $995 for a 32Kb unit to $1095 for the full 48Kb RAM Visionary 1200. It is available from Visionary Electronics, 141 Parker Ave., San Francisco, CA 94118. Reader Service number 486.

Low Cost Add-Ons For Kaypro

The AT-1 Video Attribute Add-on Circuit Board and the GR-1 Graphics Upgrade for the Kaypro II and 4 computers are new developments from JFN Industries.

The AT-1 features such screen highlighting as reversed video, reduced intensity, blinking and reverse screen. In addition, it lets you print the screen contents. Its multiple terminal-emulation capability lets the computer respond to standard Kaypro codes, codes used on the Kaypro 10, the Televideo 925 terminal, the IBM PC and most terminals.

The GR-1 adds Epson-printer compatible graphics and screen dump character translation. Both add-ons quickly connect directly to the Kaypro's circuit board without modification to the main board.

The AT-1 Video Attribute Circuit Board with Screen Dump is $149.95. The GR-1 Graphics Upgrade is $49.95. The AT-1 and GR-1 are also available packaged together for $179.95. Custom character graphics are also available from JFN Industries, 361 N. Fuller Ave., Los Angeles, CA 90036. Reader Service number 490.

Low Power 64Kb Static Memory Card

The SRAM-64 static memory card gives you up to 64Kb of static RAM. It is completely compatible with all STD Bus systems and CPU types and requires no refresh hardware.

On-board memory may be placed anywhere in the standard 64Kb memory map and multiple cards may be used to provide up to 128Kb using the memory expand line. The SRAM-64 will also accommodate standard byte-wide memory devices such as EPROMS and EEPROMS.

Other features of the SRAM-64 include full static operation, 6 MHz operation, fully buffered STD Bus lines, user-selectable card address and no need for special programming. Prices begin at $240. Computer Dynamics, Inc., 105 S. Main St., Greer, SC 29651. Reader Service number 491.

Helix PCBM— 512Kb Bubble Memory

A memory board that provides 512Kb of nonvolatile bubble memory is now available from Helix Systems and Development Corp.

Called the Helix PCBM, the memory board is switch selectable, allowing ROM BIOS to boot DOS from either a floppy disk or the bubble memory's configured disk. Four Intel 7110-4 128Kb memory modules provide built-in error correction and protection against power failure. The board performs read and write commands up to eight times faster than floppy disks; it also includes a hardware switch similar in operation to the protect notch on a floppy. The switch lets you write-protect on-board data.

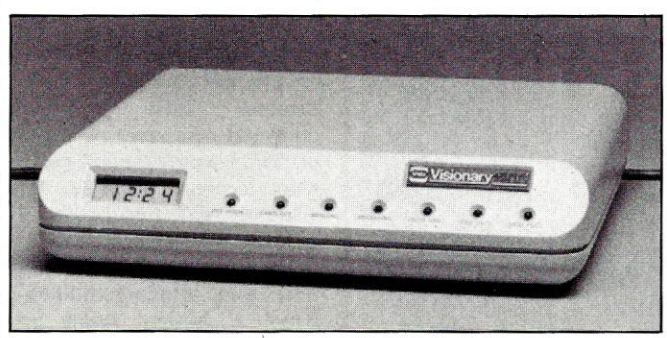
The Helix PCBM is priced at $1000 for the 256Kb version and $1500 for the 512Kb version from Helix Systems and Development Corp., 11952 Wilshire Blvd., Los Angeles, CA 90025. Reader Service number 488.

RGB Card for Apple

The DVM-III is a new RGB card for Apple Computers.

The card fits in slot 7 of the computer and accurately reproduces on RGB monitors video modes the computer is capable of displaying. The DVM-III allows you to select text color by setting soft switches on the board. The modes supported by the new RGB are:

1) 40-column white text;

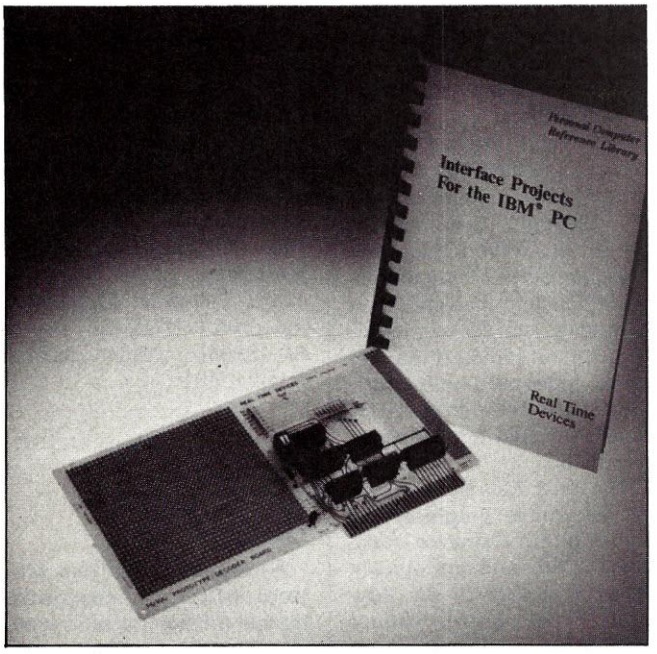


The Visionary 1200 is a 1200/300 bps modem with integral firmware and memory to store incoming and outgoing messages.

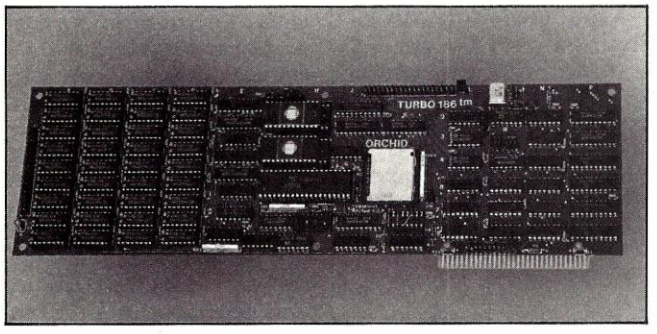
2) 80-column white text;
3) 16-color lo-res, with option of mixing 40-column text;
4) 16-color lo-res, with option of mixing 80-column text;
5) six-color hi-res, with option of mixing 40-column text;
6) six-color hi-res, with option of mixing 80-column text;
7) 16-color med-res, with option of mixing 80-column text;
8) 16-color, 140 × 192 (color double hi-res), with option of mixing 80-column text; and
9) two-color, 560 × 192 (monochrome double hi-res), with option of mixing 80-column text.

Modes 2, 4, 6, 7, 8 and 9 are only available for the Apple IIe with an 80-column card installed in the auxiliary slot. Modes 7, 8 and 9 are only available with an 80-column card that has 64Kb of resident RAM installed in the auxiliary slot.

The DVM-III is completely compatible with all Apple II 40-column software. It has a suggested retail price of $195 and a full one-year warranty from Amdek Corp., 2201 Lively Blvd., Elk Grove Village, IL 60007. Reader Service number 492.



The PD100 for the IBM PC lets you quickly interface prototype circuitry.



With an 8 MHz 80186 processor, the Turbo-186 increases the speed and performance of an IBM PC XT or compatible computer.



The Omnitronix RS-232C interface plugs into the user I/O port of the computer and converts the Commodore TTL signals to true RS-232C.

Interface Prototype Circuitry to IBM PC

The Prototype Development Board (PD100) for the IBM PC lets you quickly interface prototype circuitry to your PC.

The PD100 is a switch-selectable address decoder. Four I/O devices select input and output signals, four power supply voltages and a buffered data bus are available at wire-wrap posts. A rocker switch allows the selection of up to four unique addresses that don't contend with present IBM peripherals.

Reliable operation is ensured through use of plated-through holes, gold-plated sockets and edge card connectors.

Two areas are available for circuit prototypes; one is situated for installation of I/O connectors. These prototype areas are composed of a grid of more than 1600 pads on 0.1 inch centers suitable for soldering and installation of up to 40 wire-wrap sockets.

The PD100 is priced at $99 plus $3 for shipping and handling. A manual which includes detailed circuits of I/O ports, A/D, D/A converters, transducers and other useful interfaces is available separately for $20.

The PD100 is manufactured by Real Time Devices, PO Box 906, State College, PA 16801. Reader Service number 487.

Increase PC XT's Speed and Performance

A new board designed to increase the speed and performance of an IBM PC XT or compatible computer is now available from Orchid Technology, Inc.

Called the Turbo-186, the board consists of a plug-in processor/memory board and software. Depending upon the program that is being run, the Turbo-186 increases the speed of the IBM PC from three to ten times.

The board contains an Intel 8 MHz 80186 VLSI processor, a 16-bit data/memory bus and 128Kb of memory. Sockets are provided for on-board memory expansion to 256Kb. Using the standard 64Kb of memory, total memory can be increased to 640Kb with the addition of a piggyback memory board.

The MCI Turbo-186 software allows MS DOS programs to run transparently on the 80186 processor. It also allows the PC's 80186 processor to run concurrently, handling all machine input/output. The 80186 also provides disk caching and background printer spooling communications.

The Turbo-186 is priced at $995 and is available from Orchid Technology, 47790 Westinghouse Drive, Fremont, CA 94539. Reader Service number 489.

The Omnitronix Interface

Omnitronix has introduced a low-cost RS-232C interface for the VIC/C-64. The RS-232C Interface plugs into the User I/O port of the computer and converts the Commodore TTL signals to true RS-232C.

A two-foot cable from the interface ends in a male DB25 connector. The RS-232C interface lets you drive most serial devices, such as modem or serial printer.

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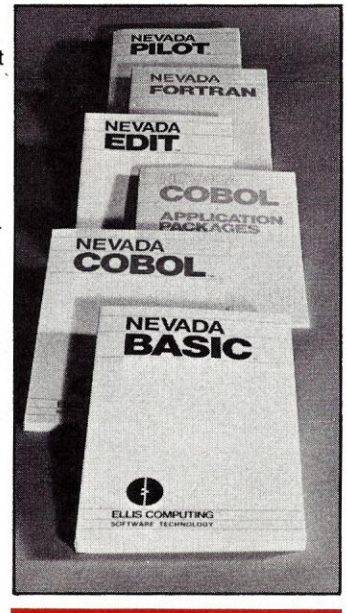
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The CP/M operating system, an 8080, 8085, or Z-80 microprocessor, and 32K RAM are required. Note: Double Density drives can read Single Density diskettes.

Circle 192 on Reader Service card.

Complete documentation contains a type-in machine language printer driver, a Basic dumb terminal program and information on how to list a Basic program to the serial printer.

The interface supports RS-232C pins 2–8, 20 and 22. All signals are independent of each other. The J-Cat-type modem is also supported by an optional connector to interface to the J-Cat special serial connector.

Priced at $39.95, the RS-232C interface is guaranteed to work for your application. The interface is not intelligent, however, and does not convert Commodore control characters to standard text in listing or printing. It is available from Omnitronix, PO Box 12309, Dept. AZP, Seattle, WA 98111; include a $1.60 shipping fee. Reader Service number 493.

Recharge Portables With Prairie Power

A lightweight external battery system, Prairie Power, by Bluestem Productions is now available for Radio Shack's Model 100, NEC's PC-18201A and other 6V briefcase portables.

Batteries come in three sizes. They are lightweight, palm-sized, small enough to fit into a briefcase or computer and have an attached six-foot, 6V cable.

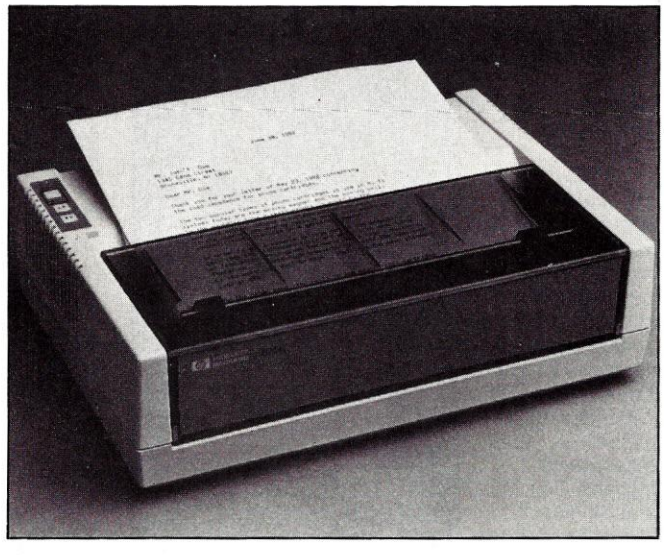
The real power rests in the energy the system supplies. Top ranked alkalines run the Model 100 for barely 20 hours and expensive nicads for only a few. The Prairie Power eight ampere-hour unit runs the Model 100 continuously for over 150 hours (the company's latest test gave 160 hours). The 5.5 ampere-hour battery supplies 100 hours of usable power. The 2.6 ampere-hour unit supplies 50 hours of continuous power and is only slightly larger than a pack of cigarettes.

Prairie Power utilizes the new technology of immobilized electrolyte construction. The batteries are a double-sealed, fluid-stabilized, lead-calcium system that can go anywhere and be used in any position. Prairie Power requires no conditioning, has no memory that prevents complete recharging and is maintenance free. The battery charger is extra.

The eight ampere-hour unit retails for $34.95; the 5.5 unit is $29.95; and the 2.6 unit is $21.95. Prairie Power is manufactured by Bluestem Productions, 2327 Lafayette Road, Wayzata, MN 55391. Reader Service number 494.



Prairie Power is a lightweight external battery system for Radio Shack's Model 100, the NEC PC-8201A and other 6V briefcase portables.



Hewlett-Parkard's HP 2225 inkjet printer operates below 50 dB. It is fully portable and may be used with either portable or desktop PCs.

Print Quietly with HP's Portable Ink-Jet Printer

Hewlett-Packard has just released their HP 2225 ink-jet printer. The fully portable printer can be used with portable or desktop PCs from HP (including the HP 150) and other manufacturers.

The HP 2225 combines the printhead with the ink reservoir in one $8 disposable unit. Key features of the HP 2225 ink-jet printer include a 150cps print speed, a noise level of less than 50 dB and bold and underline capabilities that don't slow printing as well as multiple print sizes and provisions to support 11 additional languages.

The HP 2225 offers full graphics capability (192 by 96 or 96 by 96 dots per inch), tractor and friction paper feed and the availability of such interfaces as parallel HP-IB and HP-IL (battery-powered). The printer can be used with HP, IBM, Apple, Compaq, Texas Instruments and others.

The HP 2225 has an average cartridge life of 500 pages and an average battery life (HP-IL interface only) of 200 pages. The printer uses any paper that is 8½ by 11 inches in single sheet or fanfold or 21.0 by 29.7 cm (size A4). It weighs six pounds.

The HP 2225 is available for less than $600 from Hewlett-Packard Company, 1820 Embaracadero Road, Palo Alto, CA 94303. Reader Service number 497.

AppleMouse Paints Picture

At Comdex Fall/'83, Apple Computer, Inc., demonstrated AppleMouse II and its accompanying software, MousePaint. This hardware/software combination is now available for Apple II machines.

The mouse pointing device can be used instead of a keyboard to select computer operations and modify information displayed on the screen.

The MousePaint software uses the mouse to design charts, diagrams, free-hand drawings and other visual aids for reports and presentations. You can insert text in a drawing and can choose from a variety of character fonts and fill patterns. MousePaint simulates bit-map graphics to support the Apple II's high-resolution capabilities.

AppleMouse II packaged with MousePaint software retails for $175 from Apple Computer, Inc., 10260 Bandley Drive, Cupertino, CA 95014. Reader Service number 496.

7400

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SN7400N	14	.25
SN7401N	14	.25
SN7402N	14	.25
SN7403N	14	.25
SN7404N	14	.25
SN7405N	14	.25
SN7406N	14	.45
SN7407N	14	.29
SN7408N	14	.25
SN7409N	14	.25
SN7410N	14	.25
SN7411N	14	.25
SN7412N	14	.49
SN7413N	14	.39
SN7414N	14	.49
SN7416N	14	.25
SN7417N	14	.25
SN7420N	14	.19
SN7421N	14	.49
SN7422N	14	.49
SN7423N	16	.59
SN7425N	14	.29
SN7426N	14	.29
SN7427N	14	.25
SN7428N	14	.59
SN7430N	14	.25
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SN7439N	14	.59
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SN7441N	16	.89
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SN7446N	16	.69
SN7447N	16	.69
SN7448N	16	.69
SN7450N	14	.19
SN7451N	14	.19
SN7453N	14	.19
SN7454N	14	.19
SN7459N	14	.25
SN7460N	14	.39
SN7470N	14	.29

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SN7473N	14	.35
SN7474N	14	.35
SN7475N	16	.45
SN7476N	16	.35
SN7479N	14	4.95
SN7480N	14	.89
SN7482N	14	1.49
SN7483N	16	.59
SN7485N	16	.59
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SN7489N	16	2.25
SN7490N	14	.39
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SN7492N	14	.39
SN7493N	14	.39
SN7494N	14	.89
SN7495N	14	.49
SN7496N	16	.49
SN7497N	16	3.25
SN74100N	24	1.95
SN74104N	14	1.19
SN74105N	14	1.19
SN74107N	14	**.29**
SN74109N	16	**.39**
SN74116N	24	1.49
SN74121N	14	.39
SN74122N	14	.69
SN74123N	16	.49
SN74125N	14	.45
SN74126N	14	.45
SN74132N	14	.49
SN74136N	14	.69
SN74141N	16	.89
SN74142N	16	3.95
SN74143N	24	3.95
SN74144N	24	3.95
SN74145N	16	.59
SN74147N	16	1.49
SN74148N	16	1.19
SN74150N	24	1.19
SN74151N	16	.59
SN74152N	14	.59
SN74153N	16	.59
SN74154N	24	1.25
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Part No.	**Pins	Price
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SN74160N	16	.69
SN74161N	16	.69
SN74162N	16	.69
SN74163N	16	.69
SN74164N	14	.69
SN74165N	16	.69
SN74166N	16	.89
SN74167N	16	2.95
SN74170N	16	1.29
SN74172N	24	4.95
SN74173N	16	.69
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SN74181N	24	1.95
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SN74196N	14	.89
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SN74366N	16	.55
SN74367N	16	.55
SN74368N	16	.55
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74LS

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74LS04	14	.35
74LS05	14	.29
74LS08	14	.29
74LS09	14	.29
74LS10	14	.29
74LS11	14	.35
74LS12	14	.35
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74LS20	14	.29
74LS21	14	.29
74LS22	14	**.29**
74LS26	14	.29
74LS27	14	.29
74LS28	14	.35
74LS30	14	.29
74LS32	14	.39
74LS33	14	.55
74LS37	14	.35
74LS38	14	.35
74LS40	14	.29
74LS42	16	.55
74LS47	16	.75
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74LS51	14	.25
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74LS76	16	.39
74LS78	14	.39
74LS83	16	.65
74LS85	16	.89
74LS86	14	.39
74LS90	14	.55

Part No.	**Pins	Price
74LS92	14	.55
74LS93	14	.55
74LS95	14	.79
74LS96	16	.89
74LS107	14	.39
74LS109	16	.39
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74LS165	16	1.19
74LS168	16	1.19
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74LS173	16	.69
74LS174	16	.69
74LS175	16	.69
74LS181	24	2.95
74LS190	16	.89
74LS191	16	.89

Part No.	**Pins	Price
74LS192	16	.79
74LS193	16	.79
74LS194	16	.69
74LS195	16	.69
74LS197	14	.79
74LS221	16	.89
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74LS374	20	1.49
74LS375	16	.69
74LS386	14	.45
74LS393	14	1.19
74LS399	16	1.49
74LS670	16	1.49
81LS95	20	1.49
81LS97	20	1.49

74S/PROMS*

Part No.	**Pins	Price
74S00	14	.35
74S02	14	.35
74S03	14	.35
74S04	14	.45
74S05	14	.45
74S08	14	.39
74S09	14	.39
74S10	14	.35
74S11	14	.35
74S15	14	.35
74S20	14	.35
74S22	14	.35
74S30	14	.35
74S32	14	.45
74S38	14	.89
74S40	14	.39
74S51	14	.35
74S64	14	.39
74S65	14	.39
74S74	14	.55
74S85	16	2.49
74S86	14	.55
74S112	16	.55
74S113	14	.55

Part No.	**Pins	Price
74S114	14	.55
74S133	16	.45
74S134	16	.50
74S135	16	.69
74S136	14	1.39
74S138	16	.89
74S139	16	.89
74S140	14	.55
74S151	16	.99
74S153	16	.99
74S157	16	.99
74S158	16	.99
74S160	16	2.49
74S174	16	1.19
74S175	16	1.19
74S188*	16	1.49
74S194	16	1.49
74S195	16	1.49
74S196	14	1.49
74S240	20	2.25
74S241	20	2.25
74S242	14	2.49

Part No.	**Pins	Price
74S243	14	2.49
74S244	20	2.49
74S251	16	1.19
74S253	16	1.19
74S257	16	1.19
74S258	16	1.19
74S260	14	1.19
74S280	14	1.95
74S287*	16	1.95
74S288*	16	1.95
74S373	20	2.49
74S374	20	2.49
74S387*	16	1.95
74S471*	20	5.95
74S472*	20	4.95
74S473*	20	4.95
74S474*	24	4.95
74S475*	24	4.95
74S570*	16	2.95
74S571*	16	2.95
74S572*	18	4.95
74S573*	18	4.95
74S940	20	2.49
74S941	20	2.49

CA—LINEAR

Part No.	**Pins	Price
CA3010H		1.35
CA3039H		1.35
CA3046N	14	1.35
CA3059N	14	2.95
CA3060N	16	2.95
CA3065E	14	1.49
CA3080E	8	.89
CA3081N	16	.99
CA3082N	16	1.19
CA3083N	16	1.49
CA3086N	14	.69
CA3089N	16	1.69
CA3096N	16	1.49
CA3130E	8	.89
CA3140E	8	.79
CA3160H		1.95
CA3161E	16	2.95
CA3162E	16	6.95
CA3189E	16	1.59
CA3401N	14	.59

CD—CMOS

Part No.	**Pins	Price
CD4000	14	.29
CD4001	14	**.29**
CD4002	14	.29
CD4006	14	1.19
CD4007	14	.29
CD4009	16	**.59**
CD4010	16	.59
CD4011	14	.29
CD4012	14	.29
CD4013	14	.39
CD4014	16	1.19
CD4015	16	**.39**
CD4016	14	.49
CD4017	16	1.19
CD4018	16	.99
CD4019	16	.59
CD4020	16	1.19
CD4021	16	1.19
CD4022	16	1.19
CD4023	14	.29
CD4024	14	.69
CD4025	14	.23
CD4026	16	2.49
CD4027	16	.45
CD4028	16	.69
CD4029	16	1.29
CD4030	14	.39
CD4034	24	2.49
CD4035	16	1.49

(More in Catalog)

Part No.	**Pins	Price
CD4040	16	1.19
CD4041	14	1.19
CD4042	16	.89
CD4043	16	.79
CD4044	16	.79
CD4046	16	1.19
CD4047	14	1.29
CD4048	16	.59
CD4049	16	**.39**
CD4050	16	.39
CD4051	16	.99
CD4052	16	.99
CD4053	16	.99
CD4056	16	2.95
CD4059	24	7.95
CD4060	16	1.49
CD4066	14	.59
CD4068	14	.39
CD4069	14	.29
CD4070	14	.39
CD4071	14	.29
CD4072	14	.29
CD4073	14	.29
CD4075	14	.29
CD4076	16	1.19
CD4078	14	.49
CD4081	14	**.29**
CD4082	14	.29
CD4093	14	.49

Part No.	**Pins	Price
CD4098	16	1.95
CD4506	16	1.19
CD4507	14	1.19
CD4508	24	3.95
CD4510	16	1.29
CD4511	16	1.19
CD4512	16	1.19
CD4514	24	2.49
CD4515	24	2.49
CD4516	16	1.19
CD4518	16	1.19
CD4519	16	.59
CD4520	16	1.19
CD4526	16	1.49
CD4528	16	1.49
CD4529	16	1.69
CD4543	16	1.95
CD4562	14	6.95
CD4566	16	1.39
CD4583	16	2.49
CD4584	14	.69
CD4723	16	1.19
CD4724	16	1.19
MC14409	16	13.95
MC14410	16	13.95
MC14411	24	11.95
MC14412	16	13.95
MC14419	16	7.95
MC14433	24	13.95
MC14538	16	1.19
MC14541	14	1.19

MICROPROCESSOR COMPONENTS

MICROPROCESSOR CHIPS

Part No.	**Pins	Function	Price
CDP1802	40	CPU	$2.95
2650	40	MPU (2MHz)	9.95
MCS6502	40	MPU w/Clock	5.95
MCS6502B	40	MPU w/Clock at ...Hz	9.95
6809	40	CPU—8-bit (Internal Clock) 1MHz	14.95
6809E	40	CPU—8-bit (External Clock) 1MHz	14.95
INS8035N-6	40	MPU—8-bit (6MHz)	5.95
INS8039N	40	CPU-Sgl. chip 8-bit (128bts. Ram)	5.95
INS8040N-6	40	CPU (256 bytes RAM)	9.95
INS8070N	40	CPU (64 bytes RAM)	29.95
INS8073N	40	CPU w/Basic Micro Interpreter	29.95
P8085A	40	CPU	4.95
8086	40	CPU 16-bit 5MHz	24.95
8088	40	CPU 8/16-bit	29.95
8155	40	HMOS RAM I/O Port-Timer	6.95
8748	40	HMOS EPROM MPU	24.95

Z80, Z80A, Z80B, Z8000 SERIES

Part No.	**Pins	Function	Price
Z80	40	CPU (MK3880N)(780C) 2MHz	$3.95
Z80-CTC	28	Counter Timer Circuit	3.95
Z80-DART	40	Dual Asynchronous Rec./Trans.	10.95
Z80-DMA	40	Direct Memory Access Circuit	9.95
Z80-P10	40	Parallel I/O Interface Controller	3.95
Z80-S10/0	40	Serial I/O (TxCB and RxCB Bonded)	12.95
Z80-S10/1	40	Serial I/O (Lacks DTRB)	12.95
Z80-S10/2	40	Serial I/O (Lacks SYNCB)	12.95
Z80-S10/9	40	Serial I/O	12.95
Z80A	40	CPU (MK3880N-4)(780C-1) 4MHz	4.49
Z80A-CTC	28	Counter Timer Circuit	4.95
Z80A-DART	40	Dual Asynchronous Rec./Trans.	9.95
Z80A-DMA	40	Direct Memory Access Circuit	12.95
Z80A-P10	40	Parallel I/O Interface Controller	3.95
Z80A-S10/0	40	Serial I/O (TxCB and RxCB bonded)	12.95
Z80A-S10/1	40	Serial I/O (Lacks DTRB)	12.95
Z80A-S10/2	40	Serial I/O (Lacks SYNCB)	12.95
Z80A-S10/9	40	Serial I/O	12.95
Z80B	40	CPU (MK3880N-6) 6MHz	9.95
Z80B-CTC	28	Counter Timer Circuit	12.95
Z80B-DART	40	Dual Asynch. Receiver/Transmitter	19.95
Z80B-P10	40	Parallel I/O Interface Controller	12.95
Z8001	48	CPU Segmented	44.95
Z8002	40	CPU Non-Segmented	34.95
Z8030	40	Serial Comm. Controller	44.95
Z8036	40	Counter/Timer & Parallel I/O Unit	29.95

6500/6800/68000 SERIES

Part No.	**Pins	Function	Price
MC6502A	40	MPU with clock and RAM (2MHz)	6.95
MC6520	40	Peripheral Inter. Adapter	4.95
MC6800	40	MPU	2.95
MC6802CP	40	MPU with clock and RAM	7.95
MC6809E	40	CPU (1MHz) External (Locking)	14.95
MC6821	40	Peripheral Inter. Adapt (MC6820)	2.95
MC6828	24	Priority Interrupt Controller	15.95
MC6830L8	24	1024x8-bit ROM (MC68A30-8)	9.95
MC6850	24	Asynchronous Comm. Adapter	3.95
MC6852	24	Synchronous Serial Data Adapter	5.75
MC6860	24	0-600bps Digital MODEM	7.95
MC68000L8	64	MPU 16-Bit (8MHz)	49.95
MC68488P	40	General Purpose Int. Adapter	9.95
MC68652P2	40	Multi. Protocol Comm. Controller	24.95
MC68661PB	28	Enhanced Prog. Comm. Int.	9.95
MCM68764	24	64K EPROM (450ns)	24.95
SY6522	40	Peripheral Inter. Adapter	7.95

8080A SERIES

Part No.	**Pins	Function	Price
TMS5501	40	Synchronous Data Interface (SIRC)	14.95
INS8080A	40	CPU	2.95
INS8154	40	128 Byte RAM 16-Bit I/O	13.95
8156	40	RAM with I/O Port and Timer	6.95
INS82C06	20	Octal D Flip Flop Tri-State (74C374)	2.49
DP8212	24	8-bit Input/Output (74S412)	2.25
DP8214	24	Priority Interrupt Control	2.95
DP8216	16	Bi-Directional Bus Driver	1.95
DP8224	16	Clock Generator/Driver	2.25
DP8226	16	Bus Driver	2.25
DP8228	28	System Cont./Bus Driver (74S428)	3.49
DP8238	28	System Controller (74S438)	4.49
INS8243	24	I/O Expander for 48 Series	3.95
INS8245	18	16-Key Keyboard Encoder (74C922)	4.49
INS8246	20	20-Key Keyboard Encoder (74C923)	4.95
INS8247	28	Display Controller (74C911)	8.95
INS8248	28	Display Controller (74C912)	8.95
INS8250N	40	Asyn. Comm. Element	10.95
DP8251	28	Prog. Comm. I/O (USART)	4.49
DP8253	24	Prog. Interval Timer	6.95
DP8255	40	Prog. Peripheral I/O (PPI)	4.49
DP8257	40	Prog. DMA Control	5.95
DP8259	28	Prog. Interrupt Control	6.95
DP8275	40	Prog. CRT Controller	29.95
DP8279	40	Prog. Keyboard/Display Interface	8.95
DP8303	20	8-Bit Tri-State Bi-Directional Trans.	3.95
DP8304	20	8-bit Bi-Directional Receiver	2.95
DP8307	20	8-bit Bi-Directional Receiver	2.95
DP8308	20	8-bit Bi-Directional Receiver	2.95
DP8310	20	Octal Latched Peripheral Driver	4.95
8741	40	8-bit Univ. Peripheral Interface	29.95
8755	40	16K EPROM with I/O	24.95

DISK CONTROLLERS

Part No.	**Pins	Function	Price
INS1771-1	40	Single Density	16.95
FD1791	40	Single/Dual Density (Inv.)	29.95
FD1793	40	Single/Double Density (True)	29.95
FD1795	40	Dual Density/Side Select (Inv.)	29.95
FD1797	40	Dual Density/Side Select True	29.95

SPECIAL FUNCTION

Part No.	**Pins	Function	Price
DS0025CN	8	Dual MOS Clock Driver (5MZ)	2.49
DS0026CN	8	Dual MOS Clock Driver (5MZ)	1.95
INS2651	28	Communication Chip	8.95
MC3470P	18	Floppy Disk Read Amp System	4.95
MM58167AN	24	Microprocessor Real Time Clock	8.95
MM58174AN	16	Micro. Compatible Time Clock	7.95
COP402N	40	Microcontroller w/64-digit RAM and Direct LED Drive	5.95
COP402MN	40	Microprocessor w/64-digit RAM & Direct LED Drive w/N Buss Int.	5.95
COP470N	20	32-seg VAC Fluor. Drvr. (20-pin pkg.)	3.25
MM5369AA/N	8	Prog. Oscillator/Divider (60Hz)	1.79
MM5369EST	8	Prog. Oscillator/Divider (100Hz)	1.95

DYNAMIC RAMS

Part No.	**Pins	Function	Price
1103	18	1024x1 (300ns)	.99
4027	16	**4096x1 (250ns)**	**2.49**
4116N-2	16	16,384x1 (150ns)	1.89 - 8/14.95
4116N-3	16	16,384x1 (200ns)	1.69 - 8/12.95
4116N-4	16	16,384x1 (250ns)	1.49 - 8/10.95
4164N-150	16	65,536x1 (150ns)	6.95 - 8/49.95
4164N-200	16	65,536x1 (200ns)	5.95 - 8/44.95
MM5261	18	1024x1 (300ns)	.49 - 8/1.95
MM5262	22	**2048x1 (365ns)**	.10
MM5270	18	4096x1 (250ns) MK4096	4.95
MM5280	22	4096x1 (200ns) 2107	3.95
MM5290-2	16	16,384x1 (150ns)	1.89 - 8/14.95
MM5290-3	16	16,384x1 (200ns)	1.69 - 8/12.95
MM5290-4	16	16,384x1 (250ns)	1.49 - 8/10.95
MM5298-3	16	8192x1 (200ns)	1.69

STATIC RAMS

Part No.	**Pins	Function	Price
1101	16	256x1 (650ns)	1.49
2101	22	256x4 (450ns) 8101	2.49
2102	16	1024x1 (350ns)	.89
21L02	16	1024x1 (450ns) L.P.	1.49
2111	18	256x4 (450ns) 8111	2.95
2112	16	256x4 (450ns) MOS	1.95
2114	18	1024x4 (450ns)	1.49 - 8/9.95
2114L	18	1024x4 (450ns) L.P.	1.95 - 8/13.95
2114-2	18	1024x4 (200ns)	1.75 - 8/11.95
2114L-2	18	1024x4 (200ns) L.P.	2.25 - 8/14.95
2147	18	4096x1 (70ns)	4.95
2148	18	1024x4 (70ns)	4.95
TMS4045	18	1024x4 (450ns)	3.95
TMS40L47-45	20	1024x4 (450ns)	2.95
5101	22	256x4 (450ns) CMOS	2.95
MM5257	18	4096x1 (450ns) 4044	4.95
HM6116P-3	24	2048x8 (150ns) CMOS	5.95
HM6116P-4	24	2048x8 (200ns) CMOS	4.95
HM6116LP-4	24	2048x8 (200ns) L.P. CMOS	5.49
HM6264P-15	28	8192x8 (150ns) CMOS	39.95
27LS00	16	256x1 (80ns) L.P.	9.95
7489	16	16x4 (50ns) 3101	2.25
74C920	22	256x4 (250ns)	3.95
74C921	18	256x4 (250ns) CMOS	3.95
74C929	16	1024x1 (250ns) CMOS (6501)	3.95
74C930	18	1024x1 (250ns) CMOS (6518)	3.95
74S189	16	16x4 (35ns) 93405	1.95
74S200	16	256x1 (80ns) 93410	3.95
74S206	16	256x1 (60ns) 93411	3.95
74S289	16	16x4 (35ns) 3101	2.25
82S10	16	1024x1 (50ns) O.C. (93415)	3.95
82S25	16	16x4 (50ns) O.C. (74S289)	2.25

PROMS / EPROMS

Part No.	**Pins	Function	Price
1702A	24	256x8 (1us)	4.95
2708	24	1024x8 (450ns)	3.95
2708-5	24	1024x8 (550ns) SM00246	2.95
TMS2516	24	2048x8 (450ns) 2716	5.95
TMS2532	24	4096x8 (450ns) NMC2532	6.95
TMS2564	28	8192x8 (450ns)	14.95
TMS2716	24	2048x8 (450ns) 3 voltage	9.95
2716	24	2048x8 (450ns)	4.95
2716-1	24	2048x8 (350ns)	5.95
2716Q-5	24	2048x8 (550ns)	4.49
2732	24	4096x8 (450ns)	6.95
2732A-3	24	4096x8 (300ns)	7.95
2732A-4	24	4096x8 (450ns) 21V	6.95
2732Q-4	24	4096x8 (550ns)	5.95
2758Q-A	24	1024x8 (450ns)	2.95
2764-4	28	8192x8 (450ns)	9.95
2764-3	28	8192x8 (300ns)	14.95
MM5204Q	24	512x8 (1us)	4.95
MCM68764	24	8192x8 (450ns)	24.95
27128	28	16,384x8 (450ns) 128K EPROM	59.95
74S188	16	32x8 PROM O.C. (6330-1)	1.49
74S287	16	256x4 PROM T.S. (6301-1)	1.95
74S288	16	32x8 PROM T.S. (6331-1)	1.95
74S387	16	256x4 PROM O.C. (6300-1)	1.95
74S471	20	256x8 PROM T.S. (6309-1)	5.95
74S472	20	512x8 PROM T.S. (6349-1)	4.95
74S473	20	512x8 PROM O.C. (6348)	4.95
74S474	24	512x8 PROM T.S. (DM87S296N)	4.95
74S475	24	512x8 PROM O.C. (6340)	4.95
74S476	18	1024x4 PROM T.S.	6.95
74S478	24	1024x8 PROM T.S.	8.95
74S570	16	512x4 PROM O.C. (6305)	2.95
74S571	16	512x4 PROM T.S. (6306)	2.95
74S572	18	1024x4 PROM O.C. (6352)	4.95
74S573	18	1024x4 PROM T.S. (82S137)	4.95
82S23	16	32x8 PROM O.C. (27S18)	2.95
82S115	24	512x8 PROM T.S. (27S15)	9.95
82S123	16	32x8 PROM T.S. (27S19)	2.95
82S126	16	256x4 PROM O.C. (27S20)	2.95
82S129	16	256x4 PROM T.S. (27S21)	2.95
82S130	16	512x4 PROM O.C. (27S12)	3.95
82S185	18	2048x4 PROM T.S. (TBP24S81)	9.95
82S190	24	2048x8 (80ns)	14.95
82S191	24	2048x8 (80ns)	14.95
DM87S180N	24	1024x8 PROM O.C. (82S180)	9.95
DM87S181N	24	1024x8 PROM T.S. (82S181)	9.95
DM87S184N	18	2048x4 PROM O.C. (82S184)	9.95
DM87S185N	18	2048x4 PROM T.S. (82S185)	9.95
DM87S190N	24	2048x4 PROM O.C. (82S190)	14.95
DM87S191N	24	2048x8 PROM T.S. (82S191)	14.95

DATA ACQUISITION

Part No.	**Pins	Function	Price
DC10		Mostek DC/DC Convert. +5V to -9V	2.95
MC3470P	18	Floppy Disk Read AMP System	4.95
MC1408L7	16	7-bit D/A Converter (DAC0807LCN)	1.49
MC1408L8	16	8-bit D/A Converter (DAC0808LCN)	2.25
ADC0803LCN	20	8-bit A/D Converter (±1/2LSB)	4.95
ADC0804	20	8-bit A/D Converter (1LSB)	3.49
DAC0806	16	8-bit D/A Converter (0.78% Lin.)	1.95
ADC0809	28	8-bit A/D Converter (8-Ch. Multi.)	4.49
ADC0817	40	8-bit A/D Converter (16-Ch. Multi.)	9.95
DAC1000	24	10-bit D/A Conv. Micro. Comp. (0.05%)	7.95
DAC1008	20	10-bit D/A Conv. Micro. Comp. (0.20%)	6.95
DAC1020	16	10-bit D/A Conv. (0.05% Lin.)	7.95
DAC1022	16	10-bit D/A Conv. (0.20% Lin.)	5.95
DAC1222	18	12-bit D/A Conv. (0.20% Lin.)	6.95
LM334Z		Constant Current Source	1.19
LM335Z		Temperature Transducer	1.40
LM399H		Temp. Comp. Prec. Ref. (.5ppm/C°)	5.00
AY-5-1013A	**40**	**30K Baud Uart (TR1602)**	**3.95**

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	1-9	10-99	100-up
8 pin LP	.16	.14	.13
14 pin LP	.17	.15	.14
16 pin LP	.19	.17	.16
18 pin LP	.26	.24	.23
20 pin LP	.30	.27	.25
22 pin LP	.31	.28	.26
24 pin LP	.33	.30	.28
28 pin LP	.40	.37	.35
36 pin LP	.46	.42	.39
40 pin LP	.49	.46	.43

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	1-9	10-99	100-up
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14 pin SG	.43	.39	.37
16 pin SG	.47	.43	.41
18 pin SG	.53	.49	.47
24 pin SG	.69	.65	.61
28 pin SG	.81	.76	.72
36 pin SG	1.09	1.03	.97
40 pin SG	1.21	1.14	1.08

LP

SG

ST

WW

SOLDERTAIL STANDARD (TIN)

	1-9	10-99	100-up
14 pin ST	.29	.27	.25
16 pin ST	.34	.32	.30
18 pin ST	.38	.36	.34
20 pin ST	.45	.43	.41
24 pin ST	.49	.46	.43
28 pin ST	.69	.67	.63
40 pin ST	.99	.95	.89

WIRE WRAP SOCKETS (GOLD) LEVEL #3

	1-9	10-99	100-up
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16 pin WW	.69	.65	.61
18 pin WW	.89	.85	.79
20 pin WW	1.09	1.05	.99
22 pin WW	1.25	1.19	1.15
24 pin WW	1.29	1.23	1.18
28 pin WW	1.59	1.50	1.45
36 pin WW	1.85	1.75	1.69
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DT1050 — Applications: Teaching aids, appliances, clocks, automotive, telecommunications, language translations, etc.

The DT1050 is a standard DIGITALKER kit encoded with 137 separate and useful words, 2 tones, and 5 different silence durations. The words and tones have been assigned discrete addresses, making it possible to output single words or words concatenated ihto phrases or even sentences. The "voice" output of the DT1050 is a highly intelligible male voice. Female and children's voices can be synthesized. The vocabulary is chosen so that it is applicable to many products and markets.

The DT1050 consists of a Speech Processor Chip, MM54104 (40-pin) and two (2) Speech ROMs MM52164SSR1 and MM52164SSR2 (24-pin) along with a Master Word list and a recommended schematic diagram on the application sheet.

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DT1057 - Expands the DT1050 vocabulary from 137 to over 260 words. Includes 2 ROMs and specs.
Part No. DT1057 .... $24.95 ea.

INTERSIL

*Evaluation Kits

Part No.	**Pins	Function	Price
7045IPI	28	CMOS Precision Timer	14.95
7045EV/Kit*	28	Stopwatch Chip, XTL	19.95
7106CPL	40	3½ Digit A/D (LCD Drive)	9.95
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7216CIJI	28	8 Digit Freq. Counter C.A.	24.95
7216DIPI	28	8 Digit Freq. Counter C.C.	19.95
7217IJI	28	4 Digit LED Up/Down Counter C.A.	10.95
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30009 1983 INTERSIL Data Book (1356p.) $9.95

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74HC14	14	.85
74HC20	14	.59
74HC27	14	.59
74HC32	14	.75
74HC42	16	.99
74HC51	14	.75
74HC58	14	.75
74HC73	14	.79
74HC74	14	.79
74HC75	16	.89
74HC76	16	.79
74HC85	16	1.59
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74HC158	16	.89
74HC160	16	1.29
74HC161	16	1.29
74HC162	16	1.29
74HC163	16	1.29
74HC164	14	1.29
74HC165	16	2.79
74HC173	16	1.69
74HC174	16	.99
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74HC280	14	3.95
74HC373	20	2.39
74HC374	20	2.39
74HC390	16	1.49
74HC393	14	1.49
74HC533	20	2.39
74HC534	20	2.39
74HC595	16	3.95
74HC688	20	3.19
74HC4002	14	.59
74HC4017	16	2.19
74HC4020	16	1.39
74HC4024	14	1.59
74HC4040	16	1.39
74HC4060	16	1.39
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74C—C/MOS

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74C08	14	.35
74C10	14	.35
74C14	14	.69
74C20	14	.35
74C30	14	.35
74C32	14	.39
74C42	16	1.39
74C48	16	1.95
74C73	14	.79
74C74	14	.69
74C85	16	1.95
74C86	14	.39
74C89	16	5.95
74C90	14	1.19
74C93	14	1.19

Part No.	**Pins	Price
74C95	14	1.39
74C107	14	.89
74C151	16	2.49
74C154	24	3.49
74C157	16	2.25
74C160	16	1.19
74C161	16	1.19
74C162	16	1.19
74C163	16	1.19
74C164	14	1.49
74C173	16	1.19
74C174	16	1.19
74C175	16	1.19
74C192	16	1.49
74C193	16	1.69
74C195	16	1.39

Part No.	**Pins	Price
74C221	16	1.95
74C240	20	1.95
74C244	20	1.95
74C373	20	2.49
74C374	20	2.49
74C901	14	.59
74C903	14	.59
74C906	14	.59
74C911	28	8.95
74C912	28	8.95
74C915	18	1.19
74C917	28	8.95
74C922	18	4.49
74C923	20	4.95
74C925	16	5.95
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LM301CN	8	.35
LM302H		1.95
LM304H		1.95
LM305H		.99
LM307CN	8	.45
LM308CN	8	.69
LM309K		1.25
LM310CN	8	1.75
LM311CN	8	.69
LM312H		2.49
LM317T		1.19
LM317K		3.95
LM318CN	8	1.95
LM319N	14	1.95
LM320K-5		1.35
LM320K-12		1.35
LM320K-15		1.35
LM320T-5		.89
LM320T-12		.89
LM320T-15		.89
LM323K		5.95
LM324N	14	.59
LM337T		1.95
LM338K		6.95
LM339N	14	.69
LM340K-5		1.35
LM340K-12		1.35
LM340K-15		1.35

Part No.	**Pins	Price
LM340T-5		.79
LM340T-12		.79
LM340T-15		.79
LF347N	14	1.49
LM348N	14	.99
LM350K		4.95
LF355N	8	1.10
LF356N	8	1.10
LM370N	14	4.49
LM373N	14	3.95
LM377N	14	1.95
LM380N	14	.89
LM381N	14	1.79
LM382N	14	1.39
LM384N	14	1.79
LM386N-3	8	.89
TL494CN	16	3.95
TL496CP	8	1.19
NE531V	8	2.95
NE544N	14	2.95
NE550A	14	1.95
NE555V	8	.35
LM556N	14	.69
NE564N	16	2.95
LM565N	14	1.19
LM566CN	8	1.49
LM567V	8	.99
NE570N	16	3.95
LM703CN	8	1.19
LM709N	14	.49
LM710N	14	.69
LM711N	14	.79

Part No.	**Pins	Price
LM723N	14	.55
LM733N	14	1.00
LM739N	14	1.95
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LM747N	14	.69
LM748N	8	.59
LM1310N	14	1.49
LM1458CN	8	.59
LM1488N	14	.89
LM1489N	14	.89
LM1496N	14	1.95
LM1800N	16	2.49
LM1871N	18	2.95
LM1872N	18	3.25
LM1877N-9	14	2.49
LM1889N	18	2.25
LM1896N	14	2.95
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LM3189N	16	1.59
LM3900N	14	.59
LM3905CN	8	1.19
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LM3914N	18	2.95
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LM3916N	18	2.95
RC4136N	**14**	**1.25**
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LM13080N	8	1.19
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MORE AVAILABLE

30003 1982 Nat. Linear Data Book (1952 pgs.) . $11.95

Circle 41 on Reader Service card.

(From p. 146)

program. While it tracks invoices and payments, no provision is made for the distribution of your sales information, to tell you what you've sold. That's something you find in more powerful and expensive accounting systems.

The package is written in Basic for those who want to change things. It's also easy to add or delete customers and fairly simple to update your data monthly or quarterly so it's all current. It's suggested you use the FID program on your Apple DOS master disk to do so.

Error-proofing is excellent at some levels, but not at others. For example, when you misspell a month, it won't accept it or continue until you've corrected the error. You don't have to press return when you select one of the eight main menu items. However, when you enter anything other than the numbers 1–8, the system stops.

When you ask to create an invoice for a customer who doesn't exist on disk, the program just tells you it's Out Of Data and stops. When you initially configure the package with your own name and address, if you tell Diskinvoice you want to enter more customers than it can handle, it reports it's Out Of Memory and stops. Reset halts program execution.

When you change customer information, the system doesn't display your existing data and let you change just what you must. Instead, you have to reenter it all. Screen displays aren't as clean as they could be; you see pieces of control codes for the printer and bits of other information from here and there.

It's important to note, though, that the Diskinvoice System isn't a full-blown accounting package; it isn't intended to compete with or replace that sort of thing. Rather, it's an inexpensive system to create invoices and keep track of their data in a simple yet understandable manner. And it does.

The system is not copy-protected and customer service is excellent. The package is available for either a single- or dual-drive Apple and in a Spanish language version.

Gregory Glau
Prescott, AZ

Omniwriter is an all-purpose tool that can replace high-priced software for a fraction of the cost, and it can do almost anything you want.

Omniwriter

System Requirements: Any computer running CP/M; 64Kb.
Manufacturer: Omni Systems International, 2229 McGee, Suite H, Berkeley, CA 94703.
Price: $29.95.

Omniwriter is one of those special writing tools that can do almost anything you want. It was written with added programming functions by a typesetter who wanted to make his own job easier and faster. The result is an all-purpose tool that can replace high-priced software for a fraction of the cost. In some ways, it approaches the power of a programming language; in others, it functions like a simple text editor with extra features.

A Programmer's Love

Omniwriter's primary function is that of text editor, and it performs quite well. You can write anything you want with it and manipulate your text many ways. Omniwriter's real strength is its flexibility. Programmers will love it because there is no upper limit on the size of a document. I know one person who regularly edits source code in excess of 500Kb. Both WordStar and Perfect Writer die by the time you write half that much in one document. An added plus for programmers is that the tab stops (as many as needed) can be set wherever you want them.

Another powerful feature is that you can embed macro commands anywhere in your text. If you are preparing a special announcement or flyer, you can direct your dot matrix printer to change typesizes and so on.

This programming power is handy in other ways, too. By storing a set of commands in buffers, you can do nice things like translating 8080 code into 8086 code simply by letting Omni loose with its search and replace powers. I made special use of this power to can a special invoice format for my truck repair business.

To make this into an all-purpose package, communications features have been added to the latest version. It has the power of Modem-7 and can interact with smart modems. Omni can now even download itself to other machines or send data over the phone.

Omniwriter has a certain elegance about its simplicity. While it cannot move text as easily as Perfect Writer, nor format it for printing nearly as nicely as WordStar, it is efficient in the things that it does. You can ship material out to a printer at nearly memory speed without losing anything. While it lacks menus or help screens, it does display prompt lines at the top of the screen to tell you what

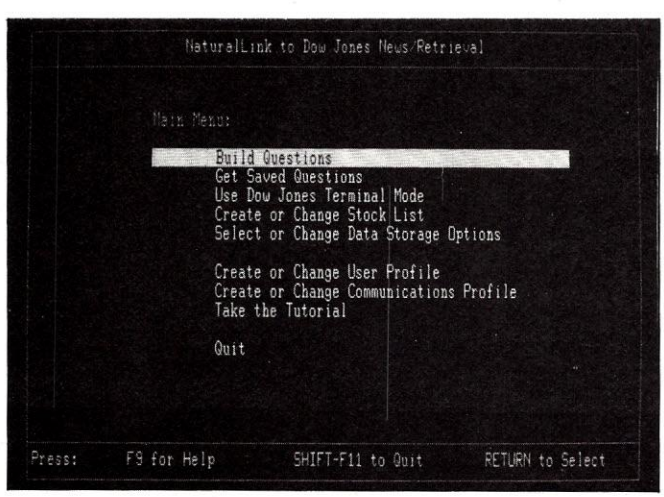


Fig. 2. NaturalLink's main menu display.

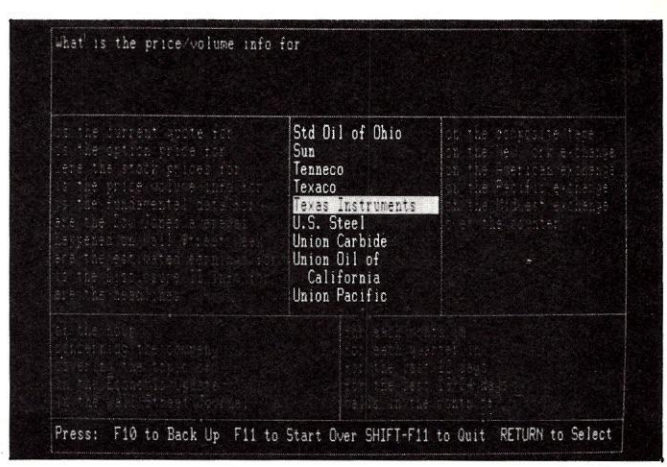


Fig. 3. Command selection: potential questions are at the top of the screen; stock market companies are listed in the middle.

you just did. There are no bells or whistles to distract you. Every function is worthwhile and serves a useful purpose. While user interface seems a little primitive, Omniwriter's power is worthy of respect.

Thomas Howe
Mill Valley, CA

NaturalLink

System Requirements: Texas Instruments Personal Computer; 128Kb; modem; a color monitor is helpful.
Manufacturer: Texas Instruments Data Systems Group, Box 402430, H-666-A, Dallas, TX 75240.
Price: $150, including Dow Jones subscription.

It's been several months now since Texas Instruments invited me to its local presentation of the first TI NaturalLink to the Dow Jones' services. I watched with awe while the program was put through its paces. I then brought it home with me to try out.

But I couldn't really convince myself that a review of this package was something that should be done. Something isn't quite right about it. Since it is now time to turn in the equipment, in fairness to my obligation, here's the review.

TI's claims about this package are impressive. When using this software, it says, you have only to select from a variety of options presented in screen-displayed windows and then piece those options together into an intelligent sentence. Absolutely true. Fig. 2 shows the program's main menu. Fig. 3 demonstrates the selection of two different commands. On the screen, in the top set of windows, are the various questions that may be appended to the stub "What", which appears at the top of the screen. In the middle is the list of stock market companies for which the file contains NYSE abbreviations. Next comes the qualifying statements of stock exchange location, and in the lower row, statements of information source and period.

. . . But Artificial Intelligence?

TI states that the product is a database software package that allows users to access the Dow Jones News/Retrieval service using plain and simple English. This is almost true. There are no database concepts in use here—simply a few flat files, one which holds the abbreviations of the stocks you are interested in, and some others which hold your communications and user-profile parameters.

Manipulation of the screen is impressive. Windows scroll where necessary, and those areas under inspection are highlighted, particularly if you use a color display. NaturalLink does indeed provide easily selected commands, and to that extent, the product has merit, as anything which will simplify your life is beneficial.

Be forewarned: completing the challenge of Planetfall is no small task. At the very least, it will take you many, many hours . . .

One of the nice things about the package is that you can prepare a file of questions for batch submission. If you want information about the same ten stocks every day, the batch submission is the least expensive way to go, particularly if the computer is prepared to simply download the information for later review.

Once you have constructed your sentence and gained access to the Dow Jones network (I used TYMNET), you do have access to the normal DJ command structure, so you aren't directly limited to the use of the NaturalLink program. There were, however, a couple of times during my test that I found there was no graceful exit—I had no recourse but to shut the machine off and start again.

The program is a capable and worthwhile tool, but I'm not convinced that it is the artificial intelligence breakthrough that TI claims it to be. My concept of artificial intelligence is that the program should assist you when you have difficulties and learn by mistakes, modifying the program as those facts are learned.

The translation from simple English (whose precise form is known) to the DJ command structure (whose precise form is also known) isn't a difficult concept to accomplish from a software point of view. The program knows which option was selected and constructs the DJ command calls accordingly. This is the kind of program that is, in concept at least, a first year trainee project.

The presentation by TI was impressive, until I got the opportunity to really digest what the company was offering. TI has a good product, but that product may well be misrepresented by calling it the result of "extensive research into artificial intelligence," as the company claims. A good product should rest on its merits, and this program has plenty of merit for its ability to bridge the awkward DJ command structure by providing a translation capability. The product's value is diminished by the hype.

Ken Lord
Winchendon, MA

Planetfall

System Requirements: IBM PC; 48Kb RAM, one 5¼-inch disk drive; any IBM-compatible display (also available for a variety of other systems).
Manufacturer: Infocom, Inc., 55 Wheeler St., Cambridge, MA 02138.
Price: $49.95.

Congratulations! You've finally made it into the Stellar Patrol. You have been assigned to the Stellar Patrol Ship Feinstein and issued an official uniform, ID card and a self-contained, multipurpose, all-weather scrub brush.

Battling on a New Frontier

Scrub brush? Yes, scrub brush. It seems that the Stellar Patrol is not all that it's cracked up to be—at least according to Planetfall, a lighthearted new adventure game from Infocom, makers of the Zork trilogy, Deadline, Starcross and other adventure games.

In Planetfall, instead of conquering aliens and exploring new worlds, you're assigned to the ignominious duty of scrubbing one of the S.P.S. Feinstein's filthiest decks—mostly as a result of falling afoul of your immediate superior, Ensign Blather—until an accident rocks the ship, catapulting you into a strange world and a challenging mission. The mission is to figure out where you are and what the problem is, and—with the help of a talkative robot named Floyd—to correct the problem.

Be forewarned: completing the challenge of Planetfall is no small task. At the very least, it will take you many, many hours, and depending on whether the lawn needs mowing, the driveway needs shoveling or your family would like to spend some time with you, it could take months.

Planetfall's documentation comes in the form of a Stellar Patrol packet, complete with a promotional brochure for the Patrol (which also manages to explain the rules of the game), an official ID card, a few pages from your diary and postcards from some of the exotic planets that you have visited.

But the real uniqueness of Planetfall is its ability to converse with players in complete sentences, the trademark of an Infocom game. Whereas early adventure games required you to make commands such as "Go door", Planetfall allows you to use complete sentences such as, "Hit the short alien with the curved rod."

Once you have booted up Planetfall, you should avail yourself of the opportunity to make the one backup that you are allowed. Losing your disk in the middle of the game is a good way to induce apoplexy.

You should also immediately begin to make a map of your surroundings. Anyone who can complete an Infocom game without a map gets my vote for the Amazing Kreskin Memory Award. You'll

also want to learn how to save a position so that you won't have to start over from scratch each time you start the game or meet an untimely demise.

Wait for the Climax

Planetfall is a fun, challenging adventure game, so don't be put off by the fact that, like Infocom's earlier game Starcross, it starts off too slowly—you basically have to sit there and wait for the climactic event (it seems there is always a climactic event in Infocom games these days): the explosion of your ship and landing on the alien planet. Don't worry, you'll have plenty to do after you land, and plenty of challenging but solvable puzzles to keep you intrigued for quite awhile.

Planetfall has been billed by Infocom as the first "space comedy," but it is more like a good lighthearted mystery, not too easy to figure out (lest you get bored) and not too difficult (lest you become frustrated).

Infocom has another winner with Planetfall. The lawn, the driveway and the family may just have to wait.

Ken Sheldon
Peterborough, NH

B/Graph 1.0

System Requirements: Atari Personal Computer; 48Kb RAM; Atari 8Kb Basic; two disk drives are recommended.
Manufacturer: Inhome Software, Inc., 2485 Dunwin Drive, Unit 8, Mississauga, Ontario, L5L 1T1 Canada.
Price: $99.

B/Graph is a professional graphics charting and statistical analysis program for any Atari Personal Computer designed to be used by individuals in sales, marketing, administration, forecasting and general management, as well as in home and small business applications.

B/Graph comes with more than 160 pages of documentation, the bulk of which is a beginner's tutorial in statistical analysis and graphing. Also included are a seven-page forward on graphing, appendixes on photographing the screen and color artifacting and a short bibliography. In addition to the ten program modules, the two program disks contain numerous demonstration graphs and tutorial examples.

> B/Graph's documentation is excellent, among the best I've seen in 21 years of dealing with computers.

The documentation is excellent, among the best I've seen in 21 years of dealing with computers. The tutorials lead you step-by-step through a complex and powerful set of programs without being condescending. The only weak points are the tutorials dealing with statistics; there's only so much you can introduce in 14 pages.

It's apparent that the authors spent a considerable amount of time on the human factors of B/Graph. Most commands are single keystrokes. Many can be entered while a graph is on the screen. An effort was made to make these the initial letters of keywords, but the constraints of having no two keywords start with the same letter leads to some minor inconsistencies: the Color command sets the hue of the display, Hue sets the luminance of the background and Intensity sets the luminance of the plotted data.

While using B/Graph, you can always press the option key to return to a menu if you forget what you're doing or what you need to do next. Data and graphs are never lost until you load in other files or exit to another program without saving your data. Before you exit, you are always asked if you wish to save your data. When you attempt to load or save a file, you have the option of obtaining a disk directory.

Printer Particulars

Upon loading B/Graph, you are first presented with the printer selection menu. You are asked to select one of the following graphics printers: Centronics, Epsom/Gemini, C.Itoh/Prowriter/NEC, Seikosha AT/100 or Okidata 92. Even if you don't have a printer, or don't wish to use one, you must still select one of the printers to proceed.

It is unlikely that after initial startup and printer selection you will need this menu again, but in the event that you have inadvertently chosen the wrong printer or wish to change printers in midsession, you may return to this menu from the program selection menu. This is appreciated, as other programs require you to reboot your system.

An addendum to the documentation states that the Okidata 92 is not 100 percent compatible with B/Graph's screen dump routine. Printer dumps performed with this model printer will show an occasional missing dot or line of dots. The addendum further states that it is "anticipated" that a custom Okidata screen dump will be provided in a future version of B/Graph.

Program Selection

Having selected a printer, you are presented with the program selection menu. It is through this menu that you move from module to module within B/Graph. You can return to this menu from any of the other program modules at any time. A copy of this menu is present on both program disks, so you need not swap disks when moving from program to program on the same disk. Should you need to swap disks, the program informs you of this at the appropriate time—a very nice touch.

- **Graphing:** This module lets you create bar graphs, 3-D bar graphs, segmented bar graphs, floating bar graphs, line graphs, scatter graphs and market graphs. Figs. 4–6 are examples of B/Graph's output.

Of the 15 different graphics and text modes Atari computers can handle, the one with the highest resolution is Graphics Mode 8, with a resolution of 320 dots horizontally by 192 dots vertically. This is the mode that B/Graph uses for all its graphs and charts.

You can create graphs with one to three factors, each with from two to 100

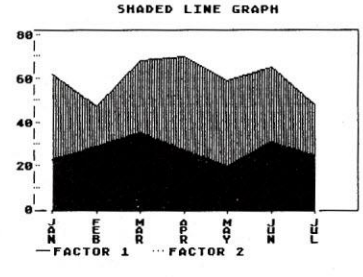


Fig. 4. Shaded two-factor line graph.

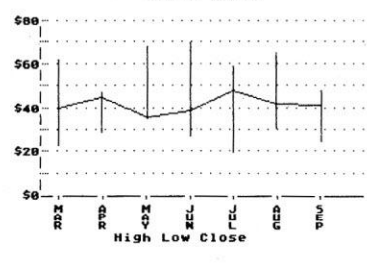


Fig. 5. Seven-month market graph.

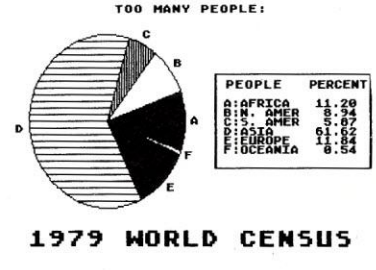
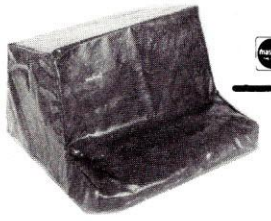


Fig. 6. Pie chart and legends.

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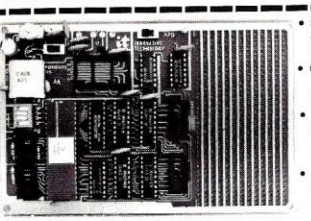


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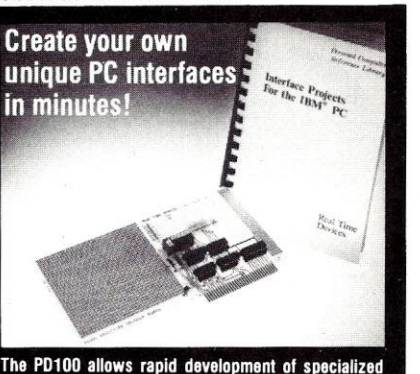
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The PD100 allows rapid development of specialized PC interfaces. It features a buffered data bus, switch-selectable address decoder, and a large prototype area (up to 40 IC sockets). The 116-page manual covers basic interfacing concepts and details implementing A/D, D/A converters, I/O ports, connection of transducers and dozens of useful circuits.

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data points. You can label points as months, years or units (although you can't change from one to another).

You can easily switch a graph from one type to another; add or remove grid lines; box or unbox a graph; rescale a graph; overlay other graphs; change the hue, foreground or background luminances; alter the graph labels; attach or unattach the points in a scatter graph; fill in graphs with up to three colors; save graph data to the disk and recall it at a later time; update current data; dump the graph or graph data to your printer; or save it in image form for further customizing and for slide shows.

You cannot produce graphs with nonlinear axes, as you would with log-log, semilog and probability paper. This limits the usefulness of B/Graph in mathematical and engineering applications. It would be nice to see these features in future versions of B/Graph.

All graphs, charts and data screens created with B/Graph may be dumped to a graphics printer. This is where I discovered the first bug in B/Graph: Once you've printed a graph, the line spacing stays at nine lines per inch. This is rather dense for listing data.

- **Pie Charts:** This module lets you create pie charts. You can call up files created with Graphing and create pie charts from those files. It doesn't matter if the files you are calling were saved as bar charts, line graphs, scatter or market graphs. However, only the first factor will be used by Pie Chart. In addition, the data must contain no more than 16 data points.

The pie charts produced by this module consist of a pie on the left hand side of the screen and legends in a box on the right. This is the only format pie chart you may create, although you may modify it with the Imaging and Labeling module.

- **Imaging and Labeling:** This module allows you to perform different tasks, each using the Image files created by the Graphing, Pie Chart and Regression modules. Each of these modules allows you to create a graph and then save it to a disk as a high-resolution picture file (Image) rather than as a data file.

Unlike other modules, this one is not copy protected and may be copied to any other disk and used with a DOS other than DOS 2.0S. This means that you need not take your B/Graph master disks with you if you wish to present a slide sequence away from your usual location.

Imaging: This portion of the module provides you with most of the functions of a good slide projector. You may place your images in defined sequences, set the time they are to remain on the screen, skip forward or backward to any image out of sequence or pause at any image.

Labeling: While the Graphing, Pie Chart and Regression modules allow text labels to be placed on the screen and altered, text is restricted in size, color and positioning. This module allows you to place text in four different sizes and up to three different colors anywhere on an image.

- **File Manipulation:** This module allows you to manipulate the factors in a data file. You can perform exponential smoothing, arithmetic or geometric moving averages, or general algebra on a factor; add, subtract, multiply or divide one factor by another; change the order of factors; delete factors; insert factors from other data files; rollover factors; and convert VisiCalc DIF and ASCII files to B/Graph format.
- **Statistical Analysis:** This module allows you to run a variety of statistical tests and computations on your data, including the t-test, the f-test, the Chi square test, normal distribution probability, binomial distribution probability, mean and median, variance and standard deviation, skewness and kurtosis, quartiles, largest and smallest.
- **Regression:** This module allows you to fit a mathematical curve to a set of data points by means of a least squares fit. You may change the regression curve, plot a function, or interpolate values. Each degree of your equation may be any valid equation which uses the variable x. You can also choose the speed at which your plot will be drawn: Very Slow, Slow, Medium, Fast and Extremely Fast.
- **Chi Square Setup:** Since the statistical analysis module works on only two factors, this program allows you to input a larger matrix of data and store it in a format easily used by the Chi square test routine.
- **Correlation Analysis:** This module allows you to compute both simple correlation coefficient and rank correlation coefficient on two factors.
- **Mini-Dos:** This module lets you format disks, obtain a disk directory, lock, unlock, rename and delete files, without exiting B/Graph.

Wrap-Up

B/Graph is a professional graphics charting and statistical analysis program that for the first time offers the Atari owner a comprehensive means of assembling, processing and displaying complex-extensive numerical data, and placing it into graphic form. Its capabilities alone justify the purchase of an Atari Personal Computer system for business graphics.

B/Graph could well serve as a touchstone for documentation and human factors. Kudos to Irata Press Ltd., programmers Michael Reichmann and Robert Wilson and especially to Ian Chadwick, who wrote the documentation and tutorial.

Philip M. Kreiker
Loveland, CO

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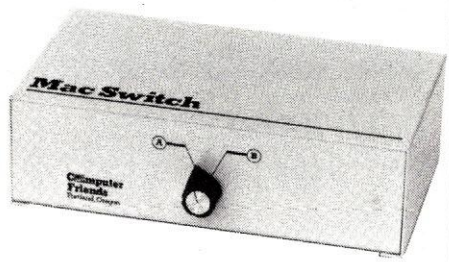
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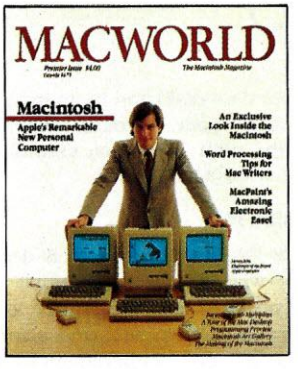
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Diskinvoice System

System Requirements: Apple II Plus or IIe; 48Kb; either single or dual drives; an Epson or comparable printer.
Manufacturer: Broadway Software, 642 Amsterdam Ave., Suite 136, New York, NY 10025.
Price: $55.

The Diskinvoice system is designed for small businesses that create fewer than 300 invoices per month for a group of regular customers. Fig. 1 shows what a Diskinvoice bill looks like. You can have up to 25 lines on each invoice and, if you wish, the program will make a duplicate copy for your records.

At the same time you create and print an invoice, the system can also save the information in a disk file so you can recall it to print summaries and simple aging reports.

When you first start the program, you select the configuration option from a menu. You then enter your business's name and address, which slot your printer is in, and the name and address information for your customers. You can also instruct the system to add sales tax automatically to each bill, although when you create an invoice you have the helpful option at that time of telling the system *not* to add tax. On each invoice, there's a spot for "deliveries and other nontaxables," which lets you charge for labor or resale items.

The package saves billing data on an individual basis (with up to 105 customers per data disk) and in an invoice file. It numbers your invoices automatically, starting with 1000; you cannot override these numbers.

```
                GLAU GAS EQUIPMENT CO.

                                          INVOICE # 1014
     DATE: MARCH 15, 1984                 YR P.O. # 663B

       TO: PORTER ELECTRIC
           123 SOUTH GLENN
           PRESCOTT, AZ     86301
     ATTN: BOB PORTER
   JOB NO: ELE-664
    TITLE: WILDES CONST. # 55

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11 START CAPACITORS                                   191.00
1 MOTOR CONTROLLER                                     56.11
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(CREDIT DUE FROM JOB # 1981-A)                       -156.00
MISC. ITEMS DELIVERED TO JOBSITE                       50.00
WELDING (OUTSIDE SERVICES)                            150.00

          SALES TAX ...                                85.05

          DELIVERIES & OTHER NON-TAXABLES...          100.00

                TOTAL.....$ 1602.56
  THANK YOU...

                508 MILLER ROAD   PRESCOTT AZ 86301
```

Fig. 1. Sample invoice output from Diskinvoice System.

Invoice Info

The Diskinvoice system is designed to work with Epson and similar printers. The package tells the printer to work in its emphasized mode, and also sets the line length to 132 characters for its aging reports. You can ask to print from disk all postings for charges and payments, only those that are old, or just data for a specific customer.

The reports are aged based on the date of each invoice, and break your bills down in the usual 30-day, 60-day and 90 plus day-old categories. However, while the 11-page instruction booklet is generally helpful, this procedure isn't outlined well and doesn't mention that you must access a file called Customer Invoice to produce the summary reports. The instruction booklet is being updated to correct this deficiency.

When you create an invoice, the system pulls the customer information from disk and prints it, along with your own heading. Each time you enter the description and price for a line item, it prints that individual line. The program would be more effective if it let you enter all of your data and then printed it all at one time.

The package also doesn't do any line extensions, so when you enter "5 filters at 1.00," you also must enter the $5 amount total for the line. The Diskinvoice System does compute and add sales tax automatically, adds in any delivery and other charges and will total the invoice for you.

Pluses and Minuses

There are some significant limitations to the Diskinvoice System but, depending on your own needs, these may not detract significantly from your use of the

(Continued on p. 140)

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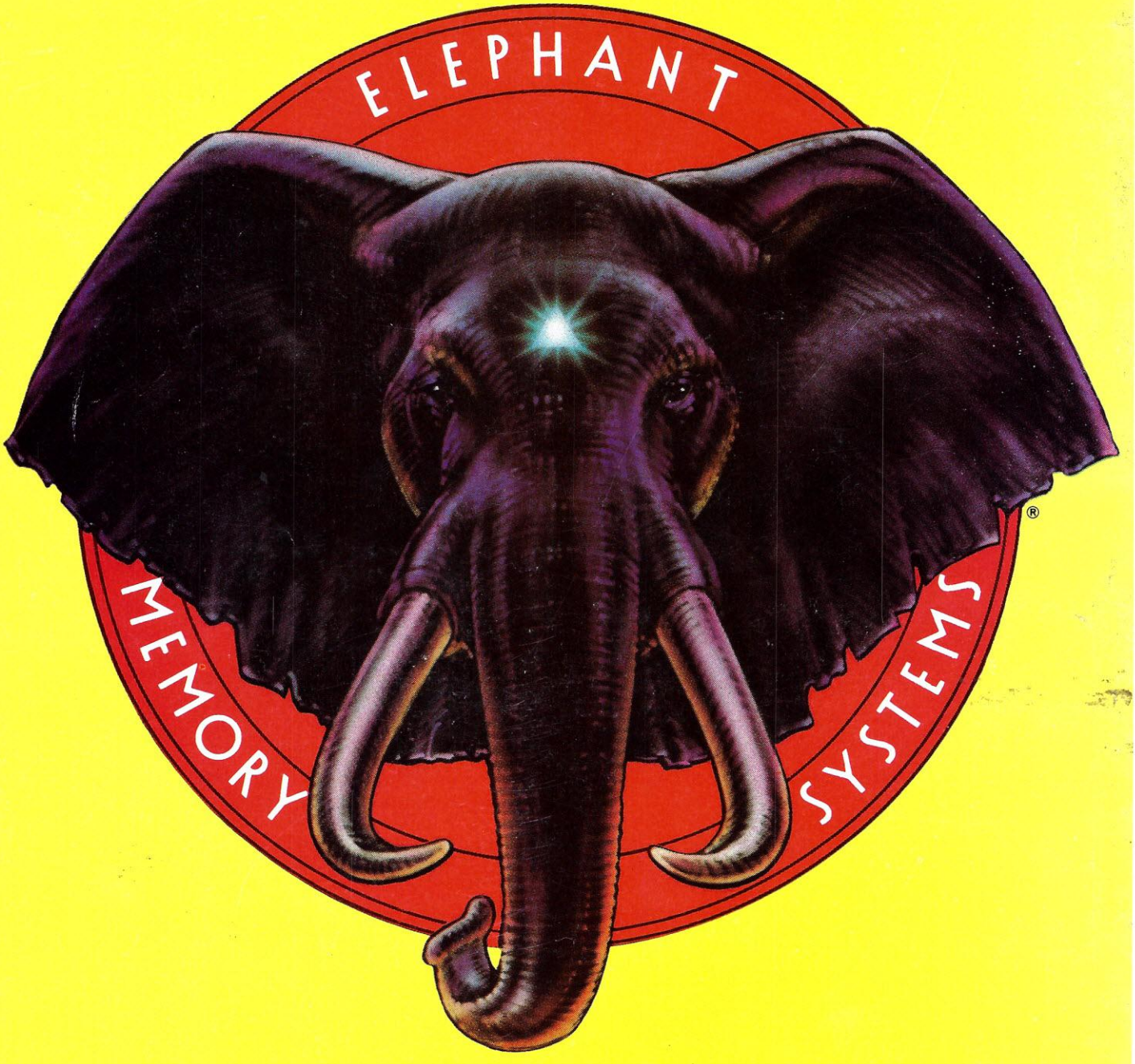
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